HS637707

FINAL REPORT NUMBER 201U-MGA-05-02

SAFETY COMPLIANCE TESTING FOR FMVSS 201U
Occupant Protection In Interior Impact
Upper Interior Head Impact Protection

FUJI HEAVY INDUSTRIES, LTD.
2005 Subaru Outback 4-Door Wagon
NHTSA No. C55501

MGA RESEARCH CORPORATION
446 Executive Drive
Troy, Michigan 48083

Test Dates: November 30 – December 1, 2004
Report Date: December 3, 2004

FINAL REPORT

PREPARED FOR:

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
400 SEVENTH STREET, SW
ROOM 6111 (NVS-220)
WASHINGTON, D.C. 20590

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16. Abstract A compliance test series was conducted on the subject 2005 Subaru Outback 4-Door Wagon, NHTSA No. C55501, in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-201U-01 for the determination of FMVSS 201U compliance. The testing was conducted at MGA Research Corporation in Troy, Michigan on November 30 – December 1, 2004. Test failures identified were as follows: None The data recorded seems to indicate that the 2005 Subaru Outback 4-Door Wagon tested appears to comply with the requirements for FMVSS 201U which were set forth by the National Highway Traffic Safety Administration.		
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1.0 PURPOSE OF COMPLIANCE TEST

The purpose of this head impact compliance test was to determine whether the subject vehicle, a 2005 Subaru Outback 4-Door Wagon, meets the performance requirements of FMVSS 201U, Occupant Protection in Interior Impact - Upper Interior Head Impact Protection.

Tests were conducted during November 30 – December 1, 2004 on a 2005 Subaru Outback 4-Door Wagon manufactured by Fuji Heavy Industries, Ltd.

All tests were conducted in accordance with the U. S. Department of Transportation, National Highway Traffic Safety Administration's Laboratory Test Procedure TP-201U-01 dated April 3, 1998 and the corresponding MGA Research Corporation's FMVSS 201U procedure number MGATP201U_FRAME#2 dated March 20, 2003.

All tests were conducted at MGA Research Corporation in Troy, Michigan and were performed by MGA engineers and technicians. The FMVSS 201U impactor test machine was used to conduct the testing. Target locations were determined by using a Coordinate Measurement Machine in conjunction with the MGA EZ-Target™ program and MGA procedure MGATP201U_Test Series dated March 20, 2003.

2.0 COMPLIANCE TEST DATA SUMMARY

The 2005 Subaru Outback 4-Door Wagon was equipped with A, B, C, and rear-pillars, grab handles above all four doors, an adjustable seat belt anchorage on each B-pillar, a seat belt anchorage on each C-pillar and the rear upper roof zone, light consoles on the front, middle, and rear upper roof zones, and a side rail curtain airbag.

Upon completion of targeting the test vehicle, twelve (12) targets were chosen to be impacted based upon engineering judgment and certification test data provided by Fuji Heavy Industries, Ltd. Targets were chosen which appeared most likely to give high HIC(d) values. The twelve (12) targets chosen were:

AP1	BP2	FH1	UR4
AP2	BP3	UR1	UR5
AP3	OP2	UR3	UR6

The 2005 Subaru Outback 4-Door Wagon tested appears to comply with the performance criteria for FMVSS 201U. The HIC(d) measured using the Part 572L (Free Motion Headform) was below 1000 for each tested component.

TABLE 2-1

SUMMARY TABLE OF TEST RESULTS

VEH. MOD YR/MAKE/MODEL/BODY: 2005 Subaru Outback 4-Door Wagon

VEH. NHTSA NO.: C55501 VIN: 4S4BP61C256325474 COLOR: Gold

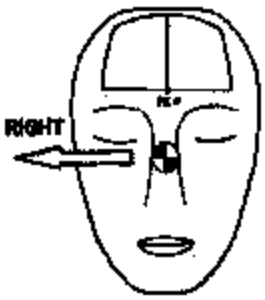
VEH. BUILD DATE: August, 2004 TEST DATES: November 30 – December 1, 2004

TEST LABORATORY: MGA Research Corporation

OBSERVERS: David Gotwals, Bryan Hood, Matt Kerr

TARGET	VEHICLE SIDE	HORIZONTAL ANGLE (deg)	VERTICAL ANGLE (deg)	VELOCITY (kph)	HIC(d)	FMH HIC	IMPACT ON FMH (mm)	
							Above	Left/Right
AP1	Right	108	29	18.8	358	254	33	5 Left
AP2	Left	204	46	18.6	334	222	23	6 Left
AP3	Right	156	45	19.4	322	206	17	0
BP2	Right	90	7	23.6	635	621	10	20 Left
BP3	Left	270	-2	23.6	594	567	20	37 Left
OP2	Right	90	0	23.9	609	587	22	3 Right
FH1	Right	180	50	23.5	770	800	11	6 Right
UR1	Left	270	32	23.9	542	498	60	17 Right
UR3	Left	270	32	23.7	847	902	15	5 Left
UR4	Right	15	50	24.2	308	188	22	7 Left
UR5	Right	90	31	23.5	679	679	40	0
UR6	Right	90	33	23.9	661	683	52	13 Left

Above and left/right refers to the position relative to reference pt. 0 where the target made contact with the Free Motion Headform. See the diagram below for details.



POST TEST COMMENTS:

The following description lists any post-test damage or other test observations for each target.

AP1 Right: Headliner deformation.

UR1 Left: Grab handle was broken during impact. Headliner deformation.

UR3 Left: Headliner deformation.

UR5 Right: Headliner displacement.

UR6 Right: The grab handle broke off the mount.

REMARKS:

The targets listed were impacted in the following order:

Right: BP2, UR5, UR6, OP2, UR4, FH1, AP3, AP1

Left: AP2, UR1, BP3, UR3

The 150 mm rule was observed for targets horizontal to each other and the 200 mm rule was observed for vertical components.

Targets AP1, AP2, and AP3 were located within the side airbag zone, so the impact velocity was reduced to 18 kph.

RECORDED BY: David G. Gotwals DATE: December 1, 2004

APPROVED BY: Helen A. Kaleto

TABLE 2-2

GENERAL TEST AND VEHICLE PARAMETER DATA

VEH. MOD YR/MAKE/MODEL/BODY: 2005 Subaru Outback 4-Door Wagon

VEH. NHTSA NO.: C55501 VIN: 4S4BP61C256325474 COLOR: Gold

VEH. BUILD DATE: August, 2004 TEST DATES: November 30 – December 1, 2004

TEST LABORATORY: MGA Research Corporation

OBSERVERS: David Gotwals, Bryan Hood, Matt Kerr

INTERIOR TRIM INFORMATION: A, B, C, and rear-pillars, grab handles above all four doors, an adjustable seat belt anchorage on each B-pillar, a seat belt anchorage on above each C-pillar and the rear upper roof zone, light consoles on the front, middle, and rear upper roof zones, and a side rail curtain airbag.

SUNROOF INFORMATION:

Installed:	_____Yes	_X_	No
Operation:	_____Electric	____	Manual

ROLL-BAR INFORMATION:

Installed:	_____Yes	_X_	No
Padded:	_____Yes	_X_	No
Braces:	_____Yes	_X_	No

GENERAL INFORMATION:

Date Received: November 17, 2004; Odometer Reading 25 miles

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured By: Fuji Heavy Industries, Ltd.

Date of Manufacture: August, 2004; VIN: 4S4BP61C256325474

GVWR: 2010 kg; GAWR FRONT: 1040 kg;

GAWR REAR: 1060 kg

DATA FROM TIRE PLACARD:

Tire Pressure with Maximum Capacity Vehicle Load:

FRONT: 220 kpa REAR: 210 kpa

Recommended Tire Size: P225/60R16; Load Range: 408 kg

Recommended Cold Tire Pressure:

FRONT: 220 kpa REAR: 210 kpa

Size of Tire on Test Vehicle: P225/60R16

Type of Spare Tire: T155/70D17 Saver: X; Standard ___

VEHICLE CAPACITY DATA:

Type of Front Seats: Bench ___; Bucket X; Split Bench ___

Number of Occupants: Front 2; Rear 3; TOTAL 5

VEHICLE CAPACITY WEIGHT (VCW) = 408 kg

No. of Occupants x 68 kg = 340 kg

Rated Cargo/Luggage Weight (RCLW) = 68 kg (difference)

WEIGHT OF TEST VEHICLE AS DELIVERED AT LABORATORY: (with maximum fluids)

Right Front =	402.5 kg	Right Rear =	353.0 kg
Left Front =	410.5 kg	Left Rear =	365.5 kg
TOTAL FRONT =	813.0 kg	TOTAL REAR =	718.5 kg
% Total Weight =	53.1 %	% Total Weight =	46.9 %

TOTAL DELIVERED WEIGHT = 1531.5 kg

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight = 1531.5 kg

Rated Cargo/Luggage Weight = 68.0 kg

Target Test Weight = 1599.5 kg

WEIGHT OF TEST VEHICLE:

Right Front =	401.0 kg	Right Rear =	387.5 kg
Left Front =	410.0 kg	Left Rear =	402.0 kg
TOTAL FRONT =	811.0 kg	TOTAL REAR =	789.5 kg
% Total Weight =	50.7 %	% Total Weight =	49.3 %

TOTAL TEST WEIGHT = 1600.5 kg

Weight of ballast secured in vehicle's cargo area = 69.0 kg

TEST VEHICLE ATTITUDE:

AS DELIVERED: Right Front 766.0 mm; Left Front 761.0 mm;
Right Rear 778.0 mm; Left Rear 770.0 mm;
Pitch Angle at Right Door Sill = 0.3 Front higher
Pitch Angle at Left Door Sill = -0.2 Front higher
Roll Angle at Front Bumper = -0.3 Right higher
Roll Angle at Rear Bumper = -0.2 Right higher

FULLY LOADED: Right Front 769.0 mm; Left Front 763.0 mm;
Right Rear 767.0 mm; Left Rear 761.0 mm;
Pitch Angle at Right Door Sill = 0.1 Front higher
Pitch Angle at Left Door Sill = 0.1 Rear higher
Roll Angle at Front Bumper = -0.4 Right higher
Roll Angle at Rear Bumper = -0.2 Right higher

AS TARGETED: Right Front 901.0 mm; Left Front 900.0 mm;
Right Rear 897.0 mm; Left Rear 896.0 mm;
Pitch Angle at Right Door Sill = 0.2 Front higher
Pitch Angle at Left Door Sill = 0.1 Rear higher
Roll Angle at Front Bumper = -0.4 Right higher
Roll Angle at Rear Bumper = -0.2 Right higher

AS TESTED ON RIGHT SIDE:

Pitch Angle at Right Door Sill = 0.2 Front higher
Pitch Angle at Left Door Sill = 0.0
Roll Angle at Front Bumper = -0.4 Right higher
Roll Angle at Rear Bumper = -0.2 Right higher

AS TESTED ON LEFT SIDE:

Pitch Angle at Right Door Sill = 0.2 Front higher
Pitch Angle at Left Door Sill = 0.0
Roll Angle at Front Bumper = -0.3 Right higher
Roll Angle at Rear Bumper = -0.2 Right higher

VEHICLE WHEELBASE = 2680 mm

REMARKS: The seat travel distance was measured to be 216 mm for the driver front seat and 216 mm for the passenger front seat.

RECORDED BY: David G. Gotwals DATE: November 17, 2004

APPROVED BY: Helen A. Kaleto

TABLE 2-3

HORIZONTAL IMPACT ANGLE RANGE FOR A AND B PILLARS

VEH. MOD YR/MAKE/MODEL/BODY: 2005 Subaru Outback 4-Door Wagon

VEH. NHTSA NO.: C55501 VIN: 4S4BP61C256325474 COLOR: Gold

VEH. BUILD DATE: August, 2004 TEST DATES: November 30 – December 1, 2004

TEST LABORATORY: MGA Research Corporation

OBSERVERS: David Gotwals, Bryan Hood, Matt Kerr

HORIZONTAL IMPACT ANGLE RANGE FOR A AND B PILLARS

	HORIZONTAL ANGLE SPECIFIED RANGE	MINIMUM HORIZONTAL ANGLE	MAXIMUM HORIZONTAL ANGLE
A-PILLAR	L 195°-255°	L 203.9°	L 251.2°
	R 105°-165°	R 107.8°	R 156.1°
B-PILLAR	L 195°-345°	L 200.4°	L 284.7°
	R 15°-165°	R 75.4°	R 160.3°

S DETERMINED USING THE PROCEDURES SPECIFIED IN S8.13.4.1

REMARKS:

ECORDED BY: David G. Gotwals DATE: November 17, 2004

APPROVED BY: Helen A. Kaleto

TABLE 2-4

VERTICAL IMPACT ANGLE RANGES

VEH. MOD YR/MAKE/MODEL/BODY: 2005 Subaru Outback 4-Door Wagon

VEH. NHTSA NO.: C55501 VIN: 4S4BP61C256325474 COLOR: Gold

VEH. BUILD DATE: August, 2004 TEST DATES: November 30 – December 1, 2004

TEST LABORATORY: MGA Research Corporation

OBSERVERS: David Gotwals, Bryan Hood, Matt Kerr

VERTICAL IMPACT ANGLE RANGES

		VERTICAL ANGLE SPECIFIED RANGE	MINIMUM VERTICAL ANGLE	MAXIMUM VERTICAL ANGLE
FRONT HEADER	FH1	L 0°-50°	L 0°	L 50°
		R 0°-50°	R 0°	R 50°
	FH2	L 0°-50°	L 0°	L 50°
		R 0°-50°	R 0°	R 50°
SIDE RAIL	SR1	L 0°-50°	L 0°	L 30°
		R 0°-50°	R 0°	R 29°
	SR2A	L 0°-50°	L 0°	L 23°
		R 0°-50°	R 0°	R 20°
	SR2B	L 0°-50°	L 0°	L 27°
		R 0°-50°	R 0°	R 38°
	SR3-1	L 0°-50°	L 0°	L 21°
		R 0°-50°	R 0°	R 19°
	SR3-2	L 0°-50°	L 0°	L 22°
		R 0°-50°	R 0°	R 20°
	SR3-3	L 0°-50°	L 0°	L 41°
		R 0°-50°	R 0°	R 46°
REAR HEADER	RH	L 0°-50°	L 0°	L 50°
		R 0°-50°	R 0°	R 50°
A-PILLAR	AP1	L -5°-50°	L -5°	L 29°
		R -5°-50°	R -5°	R 29°

			VERTICAL ANGLE SPECIFIED RANGE	MINIMUM VERTICAL ANGLE	MAXIMUM VERTICAL ANGLE
	AP2	L	-5º-50º	-5º	46º
		R	-5º-50º	-5º	47
	AP3	L	-5º-50º	-5º	44º
		R	-5º-50º	-5º	45º
B-PILLAR	BP1	L	-10º-50º	-10º	22º
		R	-10º-50º	-10º	22º
	BP2*	L	0º-50º	0º	7º
		R	0º-50º	0º	7º
	BP3	L	-10º-50º	-10º	-2º
		R	-10º-50º	-10º	-6º
	BP4	L	-10º-50º	-10º	0º
		R	-10º-50º	-10º	0º
OTHER PILLAR	OP1	L	-10º-50º	-10º	26º
		R	-10º-50º	-10º	25º
	OP2	L	-10º-50º	-10º	5º
		R	-10º-50º	-10º	0º
REAR PILLAR	RP1	L	-10º-50º	-10º	43º
		R	-10º-50º	-10º	33º
	RP2	L	-10º-50º	-10º	6º
		R	-10º-50º	-10º	6º
UPPER ROOF 1			0º-50º	0º	32º
UPPER ROOF 2			0º-50º	0º	33º
UPPER ROOF 3			0º-50º	0º	32º
UPPER ROOF 4			0º-50º	0º	50º
UPPER ROOF 5			0º-50º	0º	31º
UPPER ROOF 6			0º-50º	0º	35º

As determined using the Procedures specified in S8.13.4.2. *Target BP2 is a seat belt anchorage location.

RECORDED BY: David G. Gotwals DATE: November 17, 2004

APPROVED BY: Helen A. Kaleto

TABLE 2-5

TARGET MEASUREMENTS

VEH. MOD YR/MAKE/MODEL/BODY: 2005 Subaru Outback 4-Door Wagon

VEH. NHTSA NO.: C55501 VIN: 4S4BP61C256325474 COLOR: Gold

VEH. BUILD DATE: August, 2004 TEST DATES: November 30 – December 1, 2004

TEST LABORATORY: MGA Research Corporation

OBSERVERS: David Gotwals, Bryan Hood, Matt Kerr

Measurement	Description	Left Side	Right Side
M	Seat Fore/Aft Travel (Front seats)	216.0 mm	216.0 mm
T°	Horizontal < (CG-F1 (Left Seat) to (Right A-Pillar))	108.8°	--
A1°	360° - T°	251.2°	--
W°	Horizontal < (CG-2 (Left Seat) to (Left A-Pillar))	203.9°	--
A2°	A2° = W°	203.9°	--
U°	Horizontal < (CG-2 (Left Seat) to (Left B-Pillar))	284.7°	--
B1°	B1° = U°	284.7°	--
V°	Horizontal < (CG-R (Left Seat) to (Left B-Pillar))	200.4°	--
B2°	B2° = V°	200.4°	--
W° (right)	Horizontal < (CG-F2 (Right Seat) to (Right A-Pillar))	--	156.1°
A1° (right)	A1° (right) = W° (right)	--	156.1°
T ° (right)	Horizontal < (CG-F1 (Right Seat) to (Left A-Pillar))	--	262.2°
A2° (right)	360°-T° (right)	--	107.8°
V ° (right)	Horizontal < (CG-R (Right Seat) to (Right B-Pillar))	--	160.3°
B1° (right)	B1° (right) = V° (right)	--	160.3°
U ° (right)	Horizontal < (CG-F2 (Right Seat) to (Right B-Pillar))	--	75.4°
B2° (right)	B2° (right) = U° (right)	--	75.4°
J	A-Pillar ((Plane 3) - (Plane 5))	309.4 mm	308.7 mm
J/2	J ÷ 2	154.7 mm	154.4 mm
D1	Upper Roof ((Plane A) - (Plane B))	2107.0 mm	
D1/2	D1 ÷ 2	1053.5 mm	
D2	Upper Roof ((Plane C) - (Plane D))	1210.3 mm	
D2/2	D2 ÷ 2	605.2 mm	
.35D1	.35 x D1	737.5 mm	
.35D2	.35 x D2	423.6 mm	

Measurement	Description	Left Side	Right Side
N	B-Pillar {(BP8) - (lowest point on daylight opening forward of B-Pillar)}	417.5 mm	413.9 mm
N/2	B-Pillar {(BP3) - (lowest point on daylight opening forward of B-Pillar)}	208.8 mm	207.0 mm
N/4	B-Pillar {(BP4) - (lowest point on daylight opening forward of B-Pillar)}	104.4 mm	103.5 mm
Q	C-Pillar (Plane 13 – Plane 14)	382.6 mm	385.6 mm
Q/2	Q / 2	191.3 mm	192.8 mm
D	R-Pillar (Point 7 – Point M)	855.0 mm	874.0 mm
3D/7	3 D / 7	366.4 mm	374.6 mm

As determined using the Procedures specified in S10.1-10.13.

SgRP Locations (vehicle coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
Front	1284.4	-355.0	238.4	1284.4	355.0	248.4
Rear	2095.0	-345.0	284.4	2095.0	345.0	284.4

SgRP Locations (world coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
Front	1284.5	-353.4	224.1	1285.8	356.3	231.4
Rear	2093.4	-342.4	278.2	2094.8	347.4	275.5

CG Locations (world coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
CGF1	1228.5	-353.4	884.1	1229.8	356.3	891.4
CGF2	1444.5	-353.4	884.1	1445.8	356.3	891.4
CGR	2253.4	-342.4	938.2	2254.8	347.4	935.5

REFERENCE FOR VEHICLE COORDINATE SYSTEM (measured in millimeters):

Driver seat front outboard anchorage (x, y, z) = 913.7, -574.0, 48.9

Driver door striker upper bolt (x, y, z) = 1409.4, -761.66, 374.6

Passenger door striker upper bolt (x, y, z) = 1409.4, 761.6, 374.6

REMARKS:

RECORDED BY: David G. Gotwals DATE: November 17, 2004

APPROVED BY: Helen A. Kaleto

TABLE 2-6

SUMMARY OF TARGETING RESULTS

VEH. MOD YR/MAKE/MODEL/BODY: 2005 Subaru Outback 4-Door Wagon

VEH. NHTSA NO.: C55501 VIN: 4S4BP61C256325474 COLOR: Gold

VEH. BUILD DATE: August, 2004 TEST DATES: November 30 – December 1, 2004

TEST LABORATORY: MGA Research Corporation

OBSERVERS: David Gotwals, Bryan Hood, Matt Kerr

SUMMARY OF TARGETING RESULTS								
Target	Location (mm)			Horizontal Angle (deg)	Vertical Angle (deg)	Relocation (Yes/No)	Extension (# of 25 mm Spheres)	Impact (Yes/No)
	x	y	z					
A-Pillar Left Side								
AP1	1089.3	-534.7	991.2	246	29	No	--	No
AP2	931.9	-585.3	903.4	204	48	No	--	Yes
AP3	811.3	-613.7	839.5	204	44	No	--	No
A-Pillar Right Side								
AP1	1092.5	532.2	989.8	108	29	No	--	Yes
AP2	935.6	590.6	903.4	156	47	No	--	No
AP3	808.7	611.9	839.7	156	45	No	--	Yes
B-Pillar Left Side								
BP1	1589.6	-470.6	1087.5	270	22	No	--	No
BP2	1538.1	-588.4	865.0	270	7	No	--	No
BP3	1507.1	-601.8	880.3	270	-2	No	--	Yes
BP4	1577.6	-636.7	776.6	200	0	No	--	No
B-Pillar Right Side								
BP1	1592.6	466.6	1084.2	90	22	No	--	No
BP2	1540.1	586.6	863.0	90	7	No	--	Yes
BP3	1511.9	599.4	878.9	90	-6	No	--	No
BP4	1580.4	634.0	776.3	159	0	No	--	No

SUMMARY OF TARGETING RESULTS								
Target	Location (mm)			Horizontal Angle (deg)	Vertical Angle (deg)	Relocation (Yes/No)	Extension (# of 25 mm Spheres)	Impact (Yes/No)
	x	y	z					
Other Pillar Left Side								
OPR	2168.8	-458.9	1084.9	--	--	No	--	--
OP1	2168.8	-458.9	1084.9	270	26	No	--	No
OP2	2246.9	-595.3	893.9	270	5	No	--	No
Other Pillar Right Side								
OPR	2170.4	459.6	1085.4	--	--	No	--	--
OP1	2170.4	459.6	1085.4	90	25	No	--	No
OP2	2247.9	593.4	892.8	90	0	No	--	Yes
Rear Pillar Left Side								
RP1	2837.8	-505.2	1015.9	Target exempt from testing per S6.3(b).				--
RP2	3018.1	-581.0	865.8	Target exempt from testing per S6.3(b).				--
Rear Pillar Right Side								
RP1	2852.4	516.3	1010.6	Target exempt from testing per S6.3(b).				--
RP2	3029.2	571.7	860.1	Target exempt from testing per S6.3(b).				--
Front Header Left Side								
FH1	1017.9	-448.4	1050.2	--	--	Yes	--	--
REL	1012.1	-423.4	1049.3	180	50	--	1	No
FH2	992.9	-301.7	1057.0	180	50	No	--	No
Front Header Right Side								
FH1	1022.3	444.7	1048.0	--	--	Yes	--	--
REL	1013.7	420.9	1047.7	180	50	--	1	Yes
FH2	997.8	296.9	1056.0	180	50	No	--	No
Side Rail Left Side								
SR1	1240.2	-480.0	1058.6	270	30	No	--	No
SR2-A	1390.2	-472.4	1069.7	270	23	No	--	No
SR2-B	1290.8	-491.8	1077.1	--	--	Yes	--	--
REL	1294.0	-463.7	1080.4	270	27	--	1	No

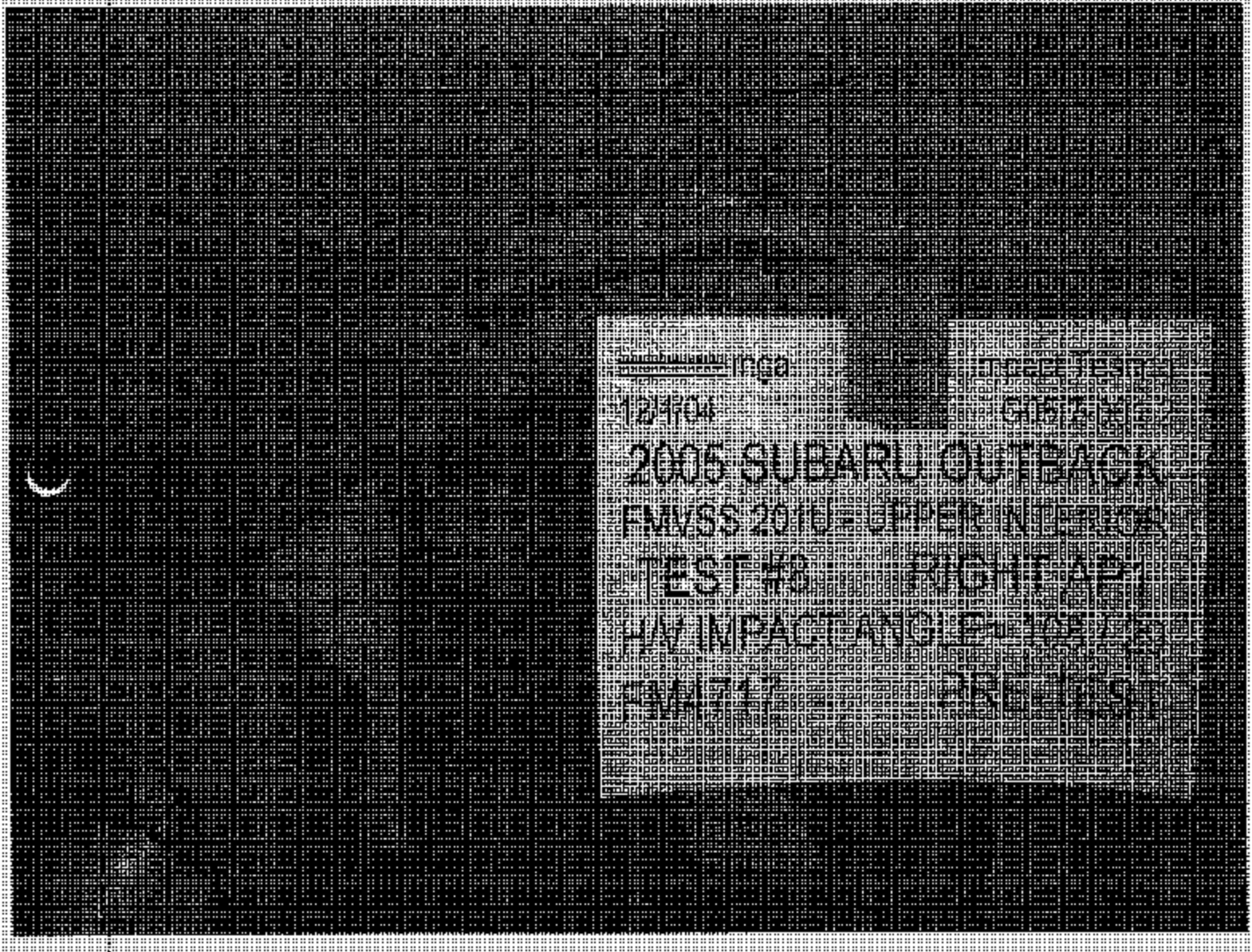
SUMMARY OF TARGETING RESULTS								
Target	Location (mm)			Horizontal Angle (deg)	Vertical Angle (deg)	Relocation (Yes/No)	Extension (# of 25 mm Spheres)	Impact (Yes/No)
	x	y	z					
SR3-1	1798.5	-460.2	1081.6	270	21	No	--	No
SR3-2	1962.3	-460.9	1077.9	270	22	No	--	No
SR3-3	2317.6	-474.9	1068.7	270	41	No	--	No
Side Rail Right Side								
SR1	1242.0	474.8	1058.4	90	29	No	--	No
SR2-A	1391.8	469.4	1068.9	90	20	No	--	No
SR2-B	1292.7	485.1	1078.6	--	--	Yes	--	--
REL	1290.9	458.8	1077.6	90	38	--	1	No
SR3-1	1800.2	459.5	1081.7	90	19	No	--	No
SR3-2	1961.5	458.4	1080.2	90	20	No	--	No
SR3-3	2320.5	475.3	1067.2	90	46	No	--	No
Rear Header Left Side								
RH	2808.5	-340.5	1053.7	Target exempt from testing per S6.3(b).				No
Rear Header Right Side								
RH	2818.1	347.9	1052.3	Target exempt from testing per S6.3(b).				No
Upper Roof Left Side								
UR1	1226.6	-418.7	1100.2	270	32	No	--	Yes
UR2	1585.4	-419.3	1119.7	270	33	No	--	No
UR3	2166.7	-418.9	1121.8	270	32	No	--	Yes
Upper Roof Right Side								
UR4	2679.7	358.0	1045.9	90	50	No	--	Yes
UR5	1592.5	415.0	1118.4	90	31	No	--	Yes
UR6	1385.9	384.6	1131.5	90	33	No	--	Yes

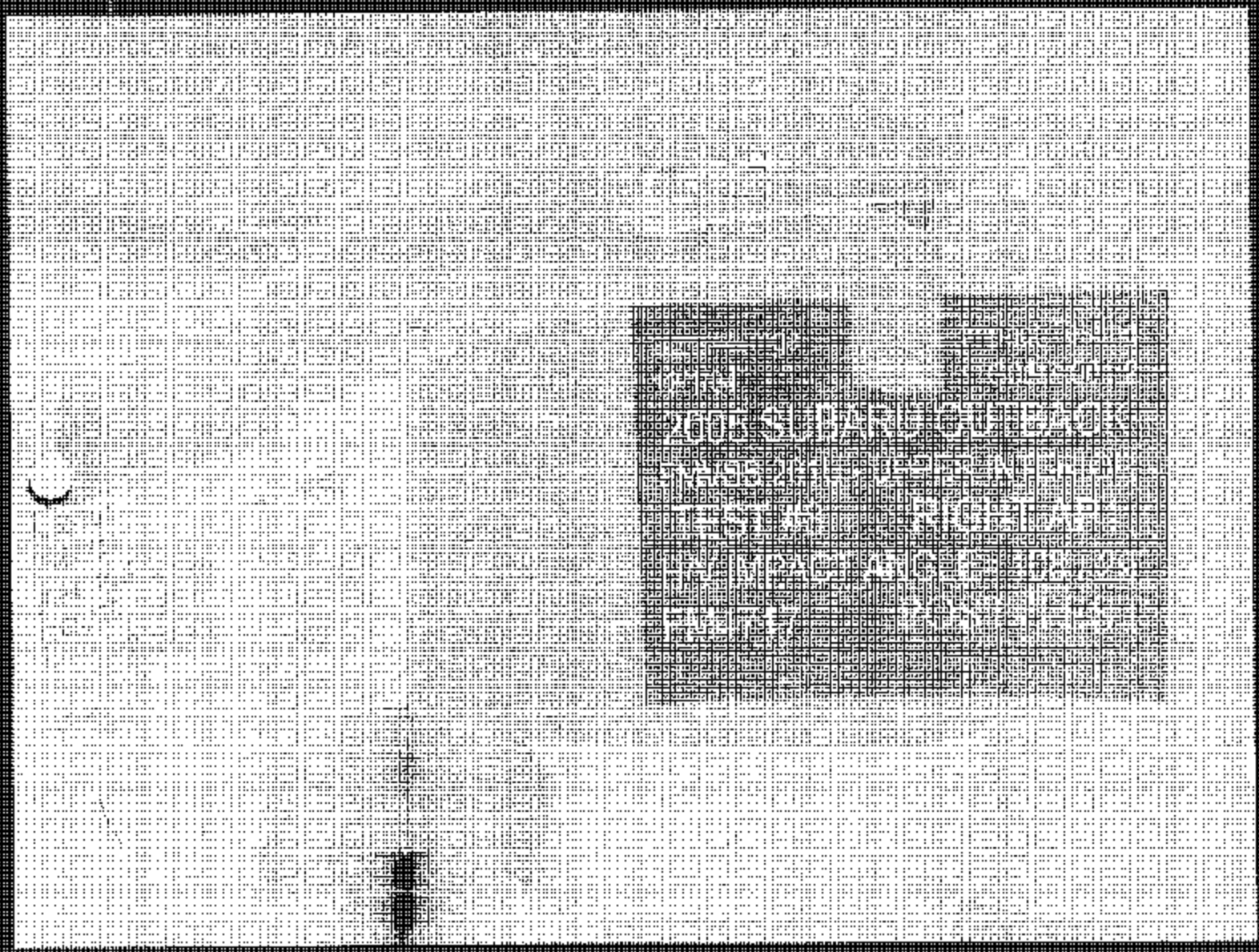
As determined using the Procedures specified in S10.1-10.13.

REMARKS: Targets RP1, RP2, and RH on each side were found to be greater than 600 mm rearward of the rearmost SgRP and therefore exempt from testing per S6.3(b).

RECORDED BY: David G. Gotwals DATE: November 17, 2004

APPROVED BY: Helen A. Kaleto


2005 SUBARU OUTBACK
FMVSS 201U - OPEN INTERIOR
TEST NO. 5NGUT-A21
24" IMPACT ANGLE
TEST DIRECTION





MICHIGAN OPERATIONS
DATE: 2/8/01
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3
REVISION NO.: 2
PAGE 1 OF 1

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G05I7-001.2 VEHICLE YR/MAKE/MODEL:2005/Subaru/Outback

GENERAL TEST PARAMETERS:

Target (Vehicle Side): AP1Right

MGA Test Reference No.:FM4717

Approach Horizontal Angles:108°

Approach Vertical Angles:29°

Additional Description:

Test Number:#9

Temperature:21C

Humidity:31%

Time of Test:10:09 AM

FMH Serial No:036

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
358	254	6.4	18.8	33	5 L

INSTRUMENTAION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35923	-99.8	1.44	1.44
Y	6	J35918	99.7	1.54	1.54
Z	7	J35918	98.1	1.18	1.17

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

Headliner deformation.

Recorded By: _____ Approved By*: _____ Date: 12/1/04

*Only necessary for NHTSA (Government) Compliance testing.

FMH
G05I7-001.2

Customer: Subaru
Test # 8
FM4717
Additional Desc: N/A

Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005
Target: AP1
Vehicle Side: Right
Horz/Vert Angle: 108/29

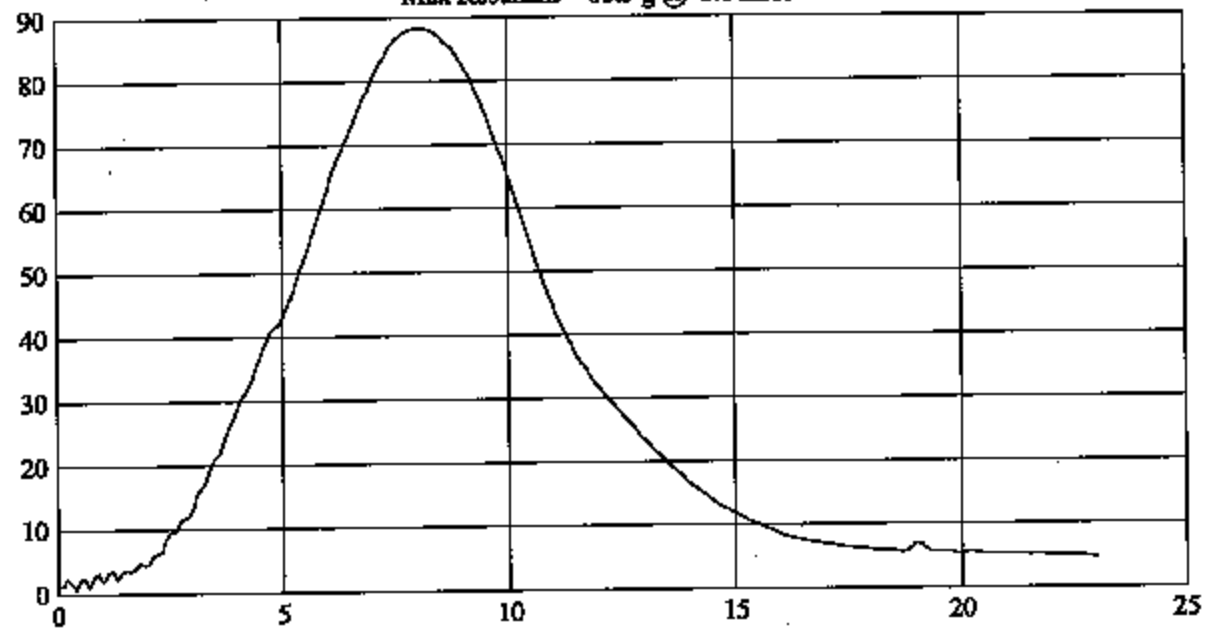
HIC(d) = 358, HIC = 254, Delta T = 6.4 msec

Max Resultant = 88.5 g's @ 36.3 mm



Resultant (g's) vs. Displacement (mm)

Max Resultant = 88.5 g @ 8.1 msec



Resultant Accel (g's) vs. Time (msec)

Customer: Subaru
Test # 8
FM4717
Additional Desc: N/A

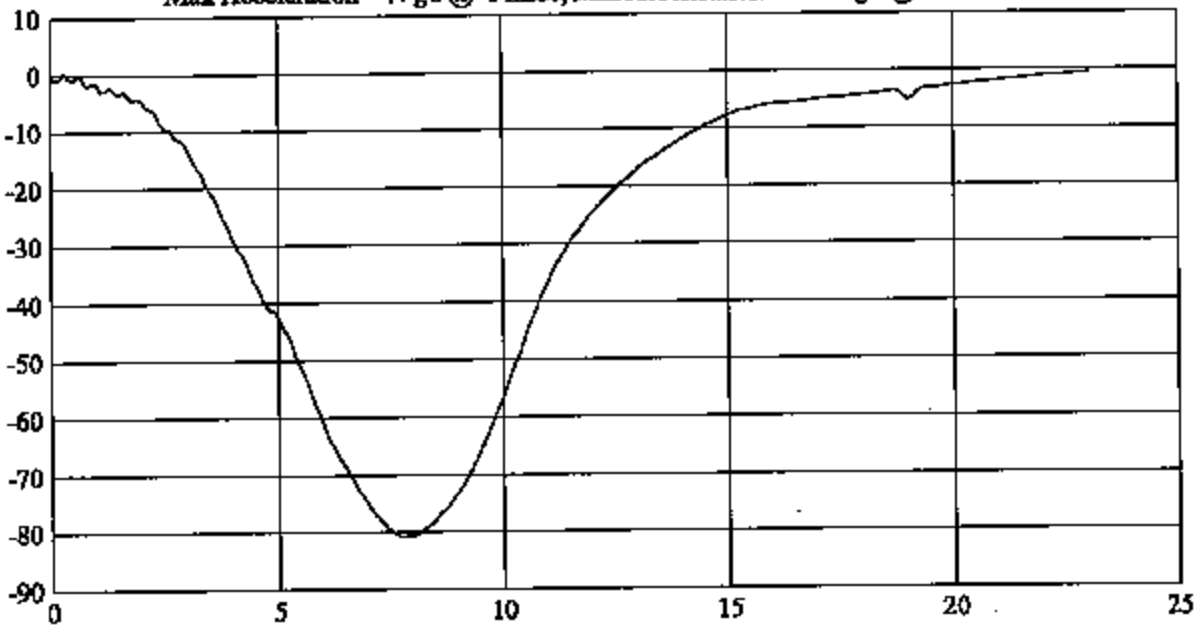
Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005
Target: AP1
Vehicle Side: Right
Horz/Vert Angle: 108/29

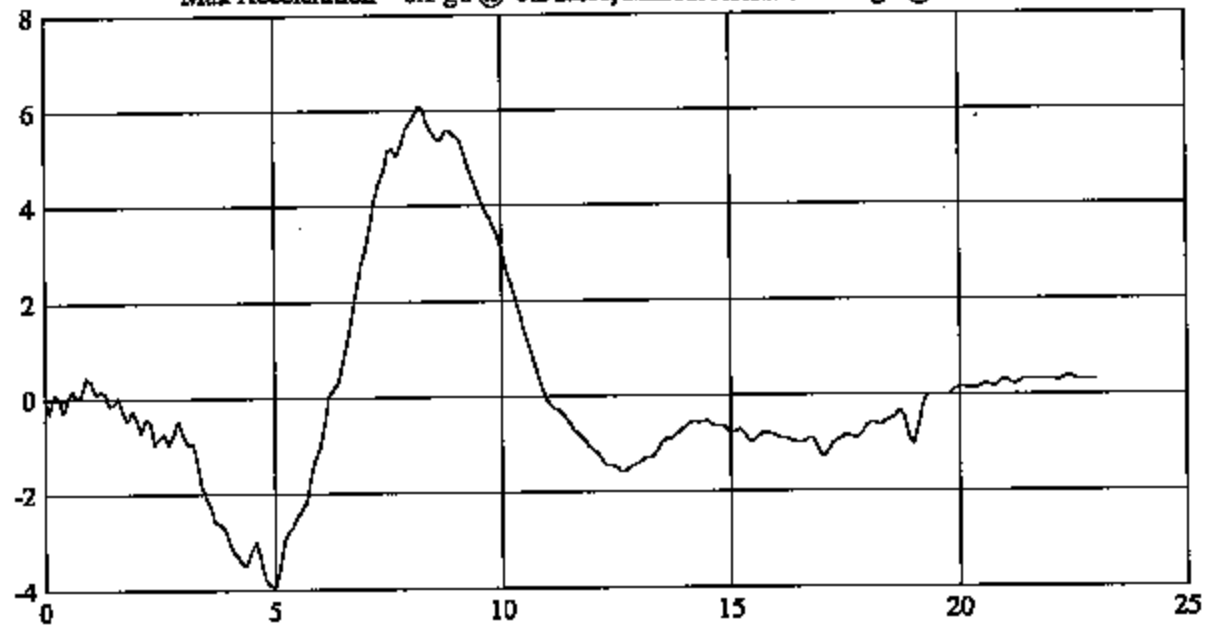
HIC(d) = 358, HIC = 254, Delta T = 6.4 msec

Max Acceleration = .4 g's @ 0 msec, Min Acceleration = -80.9 g's @ 7.7 msec



Accel X (g's) vs. Time (msec)

Max Acceleration = 6.1 g's @ 8.2 msec, Min Acceleration = -4 g's @ 5 msec



Accel Y (g's) vs. Time (msec)

Customer: Subaru
Test # 8
FM4717
Additional Desc: N/A

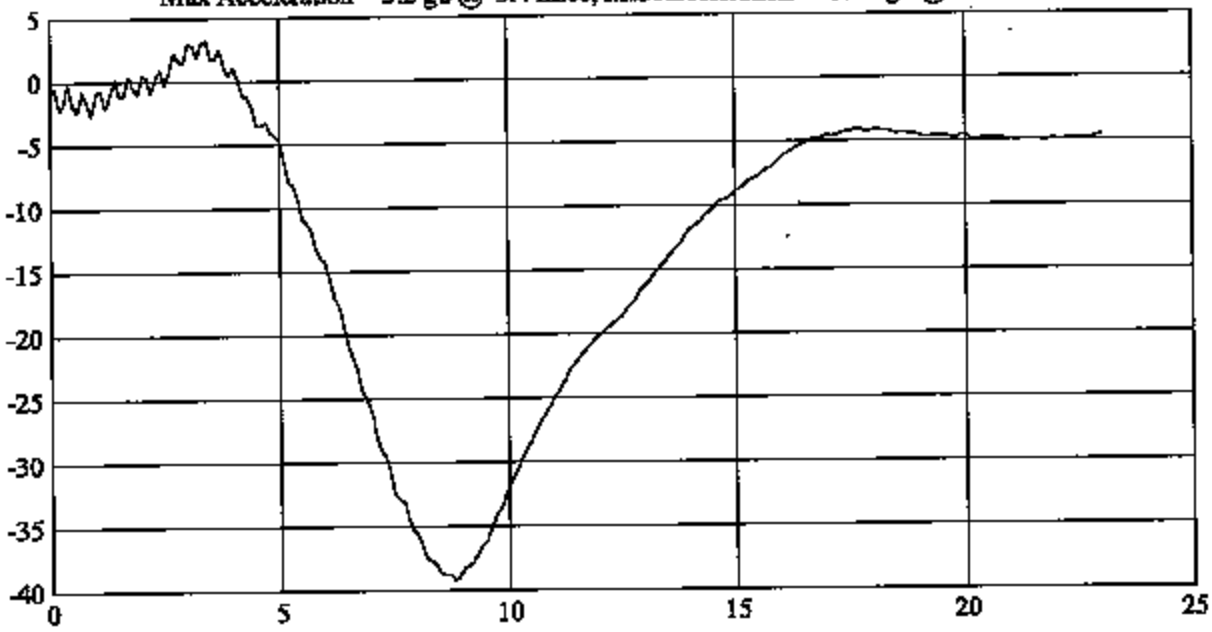
Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005
Target: AP1
Vehicle Side: Right
Horz/Vert Angle: 108/29

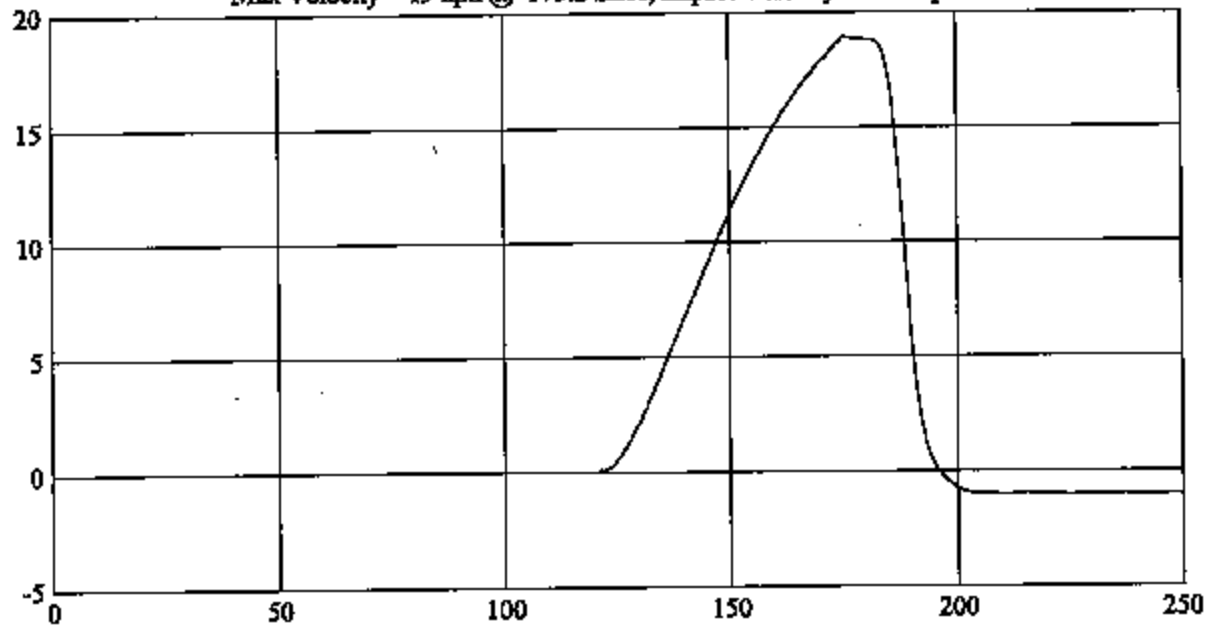
HIC(d) = 358, HIC = 254, Delta T = 6.4 msec

Max Acceleration = 3.2 g's @ 3.4 msec, Min Acceleration = -39.2 g's @ 8.8 msec



Accel Z (g's) vs. Time (msec)

Max Velocity = 19 kph @ 175.2 msec, Impact Velocity = 18.8 kph



Velocity (kph) vs. Time (msec)

FMH
G05I7-001.2

Customer: Subaru
Test # 8
FM4717
Additional Desc: N/A

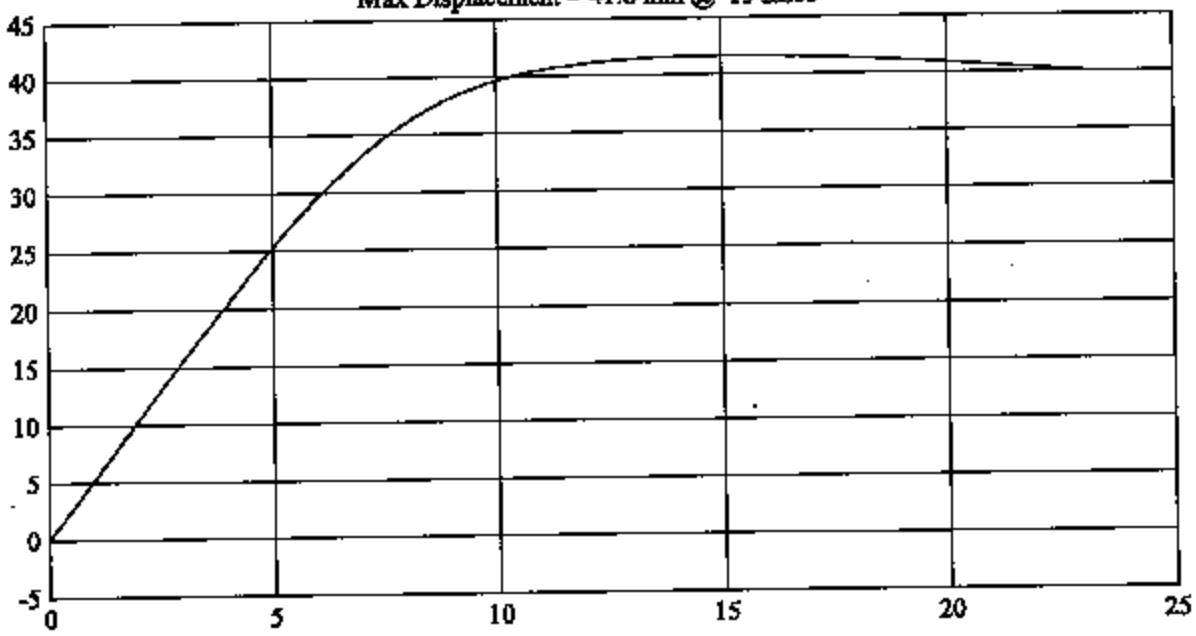
Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005
Target: AP1
Vehicle Side: Right
Horz/Vert Angle: 108/29

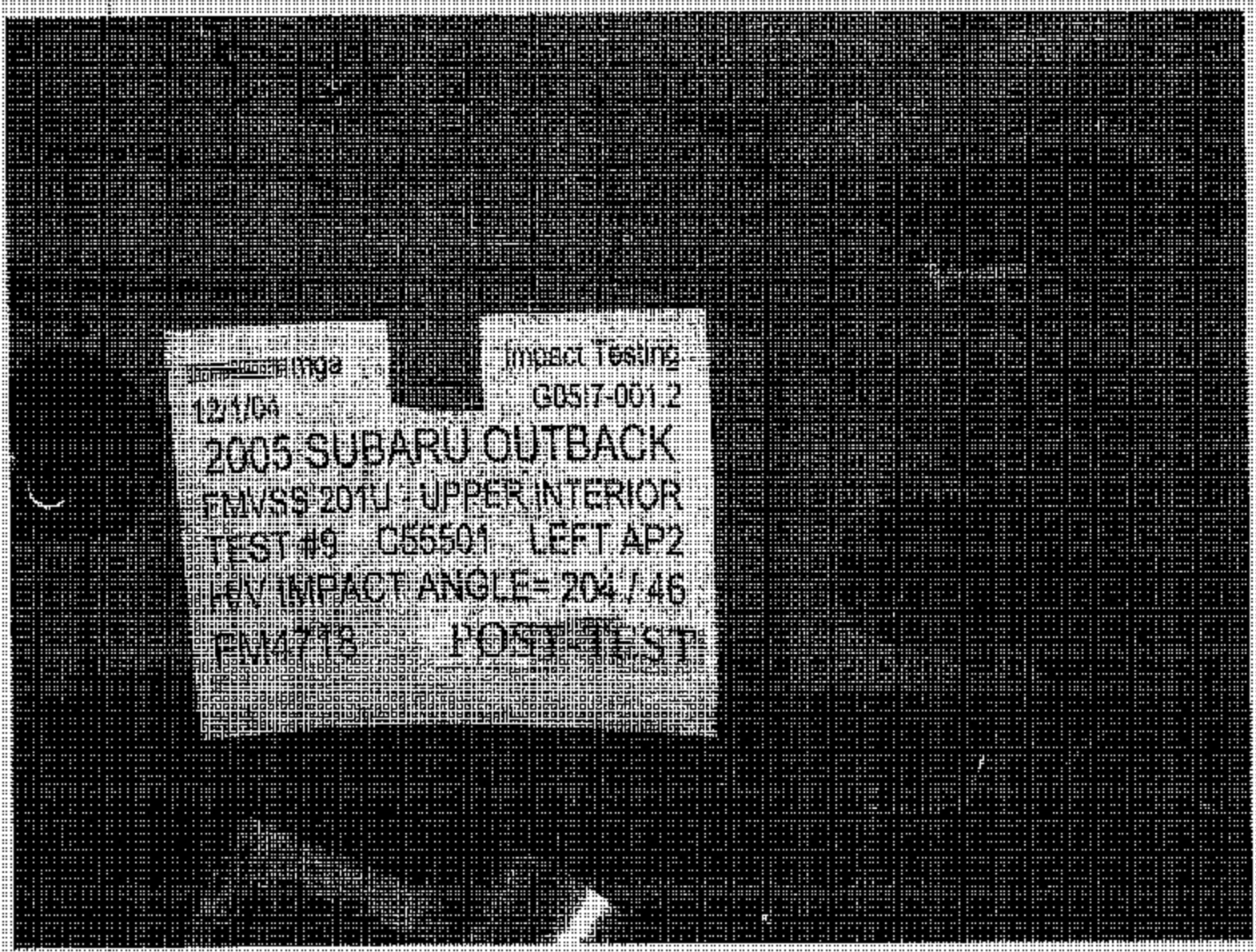
HIC(d) = 358, HIC = 254, Delta T = 6.4 msec

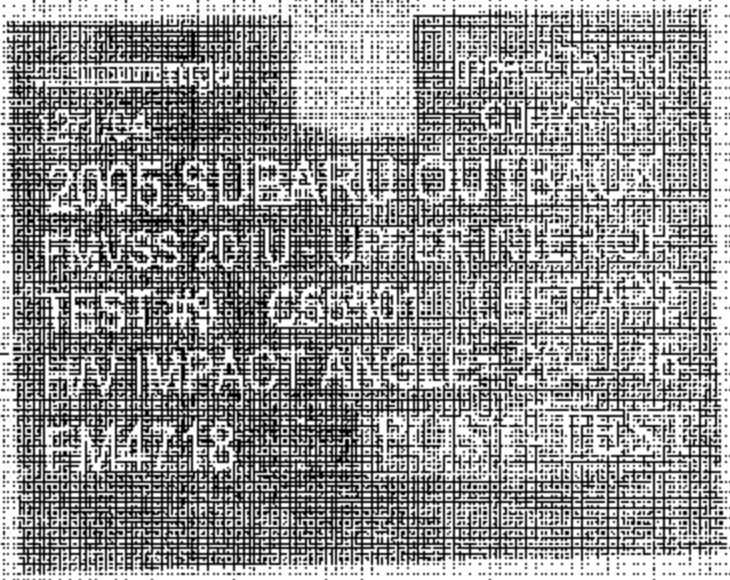
Max Displacement = 41.6 mm @ 15 msec



Displacement (mm) vs. Time (msec)




Impact Testing
12/1/05
G05I7-0012
2005 SUBARU OUTBACK
FMVSS 201U - UPPER INTERIOR
TEST #9 C55501 LEFT AP2
HIV IMPACT ANGLE= 204 / 46
PM4718 POST TEST



MICHIGAN OPERATIONS
DATE: 2/8/01
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3
REVISION NO.: 2
PAGE 1 OF 1

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G05I7-001.2 VEHICLE YR/MAKE/MODEL:2005/Subaru/Outback

GENERAL TEST PARAMETERS:

Target (Vehicle Side): AP2 Left

MGA Test Reference No.:FM4718

Approach Horizontal Angles: 204°

Approach Vertical Angles:46°

Additional Description:

Test Number:#9

Temperature:21C

Humidity:31%

Time of Test:2:00 PM

FMH Serial No:037

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
334	222	11.6	18.6	23	6L

INSTRUMENTAION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35800	-98.4	1.44	1.44
Y	6	J35841	92.6	1.54	1.54
Z	7	J35791	88.8	1.18	1.17

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage.

Recorded By: _____ Approved By*: _____ Date: 12/1/04

*Only necessary for NHTSA (Government) Compliance testing.

Customer: Subaru
Test # 9
FM4718
Additional Desc: N/A

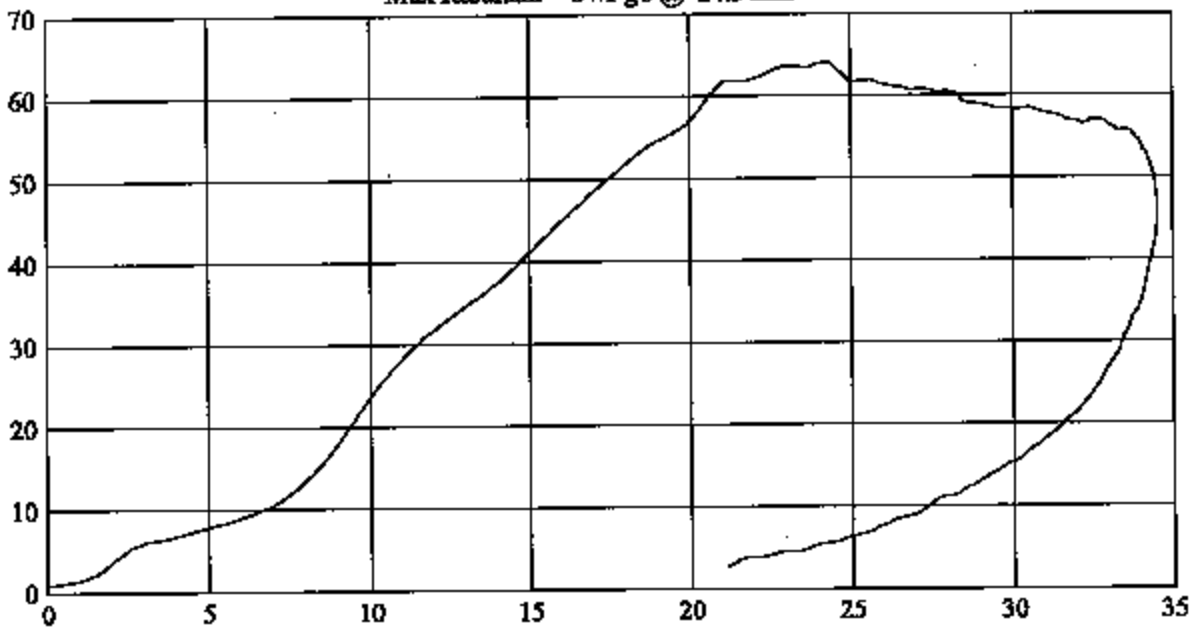
Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005
Target: AP2
Vehicle Side: Left
Horz/Vert Angle: 204/46

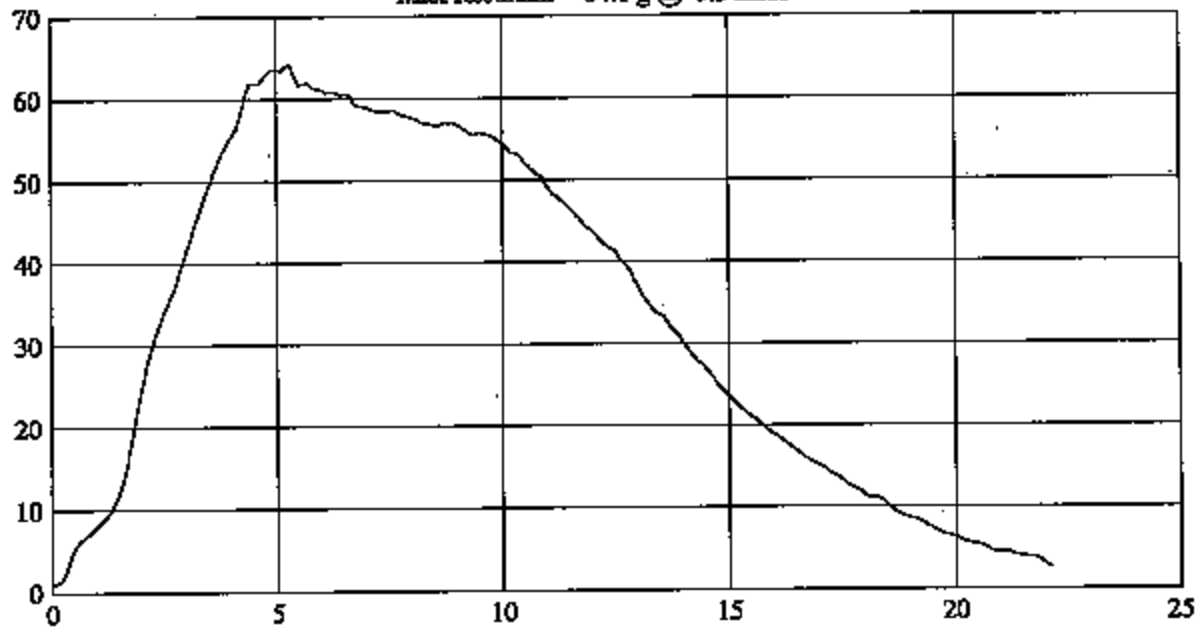
HIC(d) = 334, HIC = 222, Delta T = 11.6 msec

Max Resultant = 64.1 g's @ 24.3 mm



Resultant (g's) vs. Displacement (mm)

Max Resultant = 64.1 g @ 5.3 msec



Resultant Accel (g's) vs. Time (msec)

Customer: Subaru
Test # 9
FM4718
Additional Desc: N/A

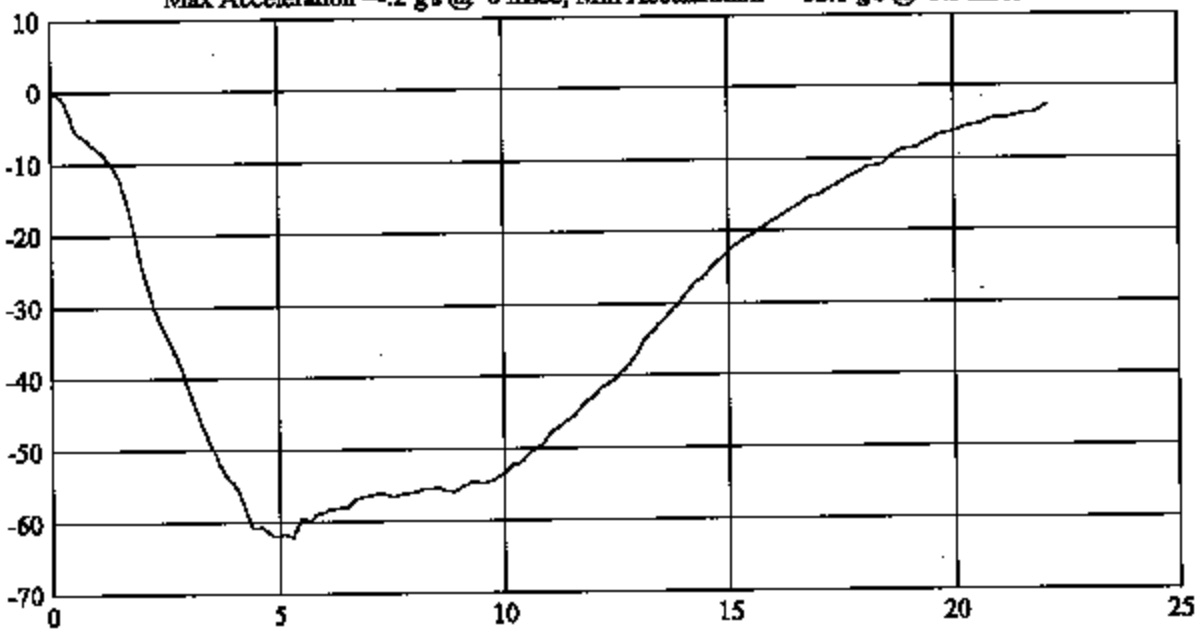
Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005
Target: AP2
Vehicle Side: Left
Horz/Vert Angle: 204/46

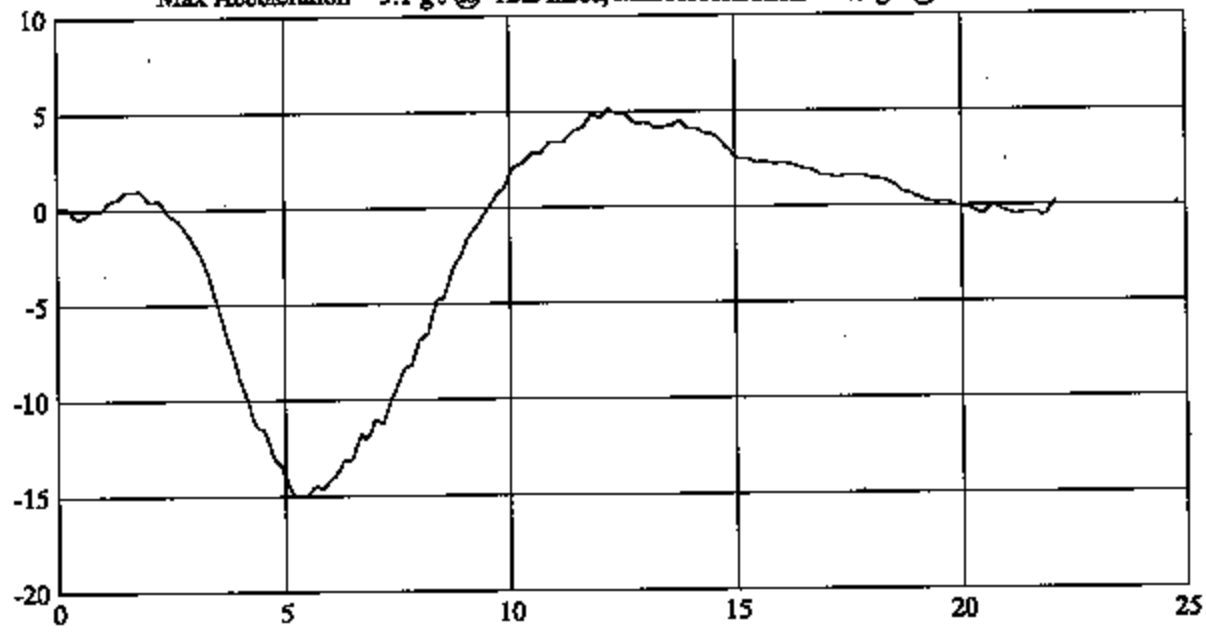
HIC(d) = 334, HIC = 222, Delta T = 11.6 msec

Max Acceleration = -.2 g's @ 0 msec, Min Acceleration = -62.1 g's @ 5.3 msec



Accel X (g's) vs. Time (msec)

Max Acceleration = 5.1 g's @ 12.2 msec, Min Acceleration = -15 g's @ 5.4 msec



Accel Y (g's) vs. Time (msec)

Customer: Subaru
Test # 9
FM4718
Additional Desc: N/A

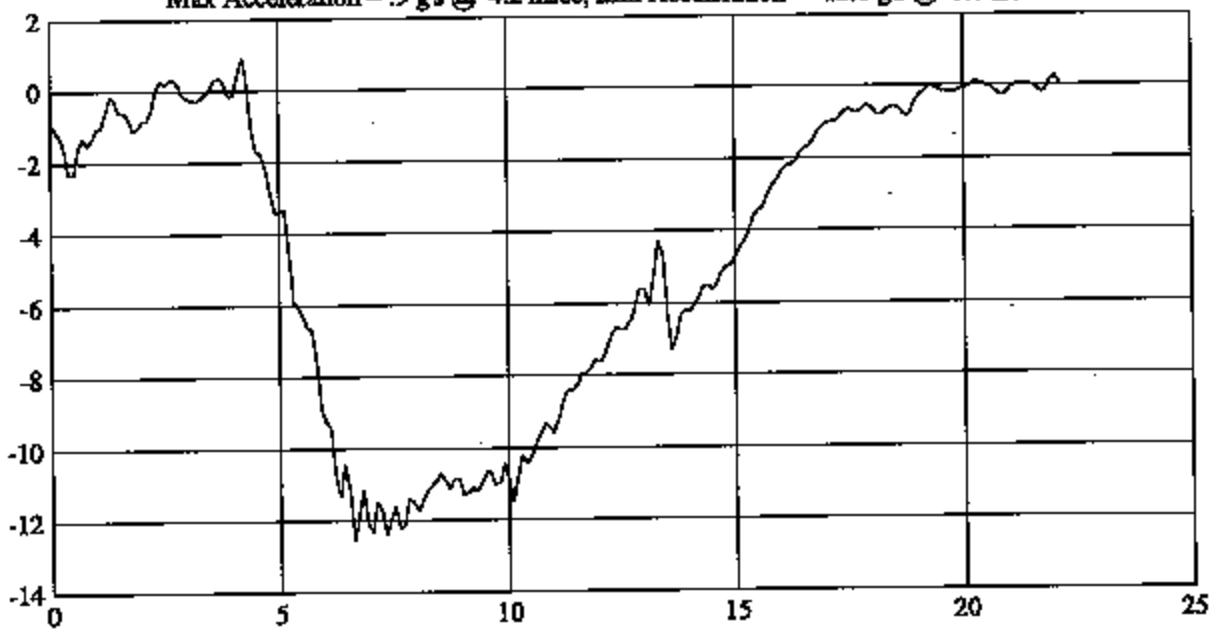
Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005
Target: AP2
Vehicle Side: Left
Horz/Vert Angle: 204/46

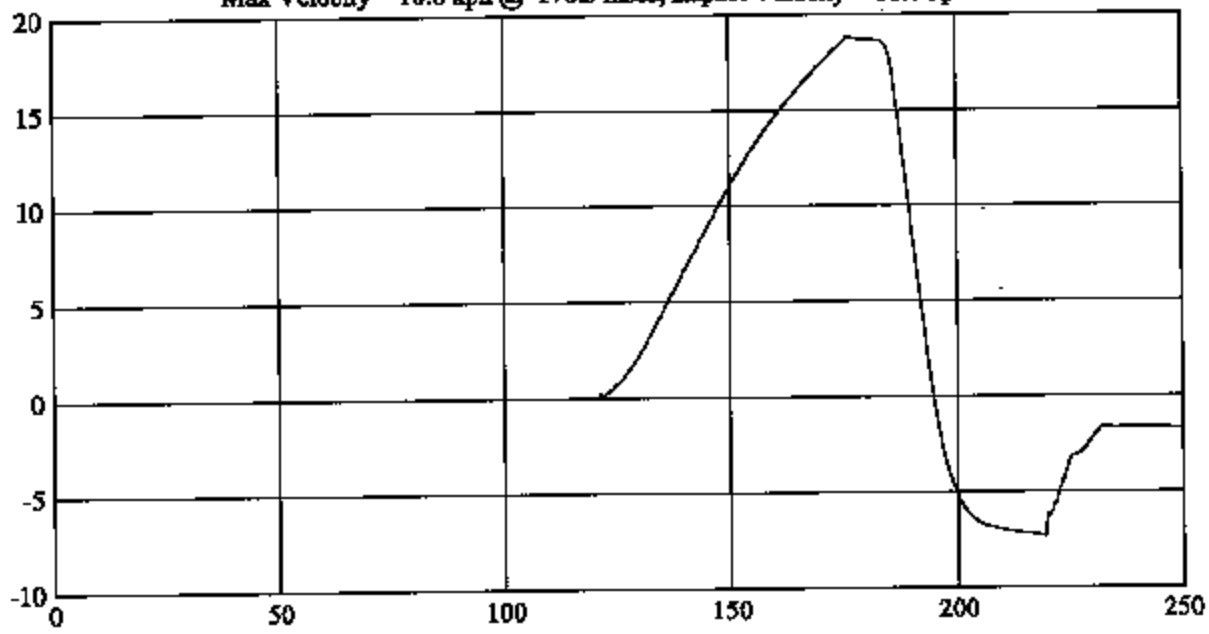
HIC(d) = 334, HIC = 222, Delta T = 11.6 msec

Max Acceleration = .9 g's @ 4.2 msec, Min Acceleration = -12.6 g's @ 6.6 msec



Accel Z (g's) vs. Time (msec)

Max Velocity = 18.8 kph @ 176.3 msec, Impact Velocity = 18.6 kph



Velocity (kph) vs. Time (msec)

FMH
G05I7-001.2

Customer: Subaru
Test # 9
FM4718
Additional Desc: N/A

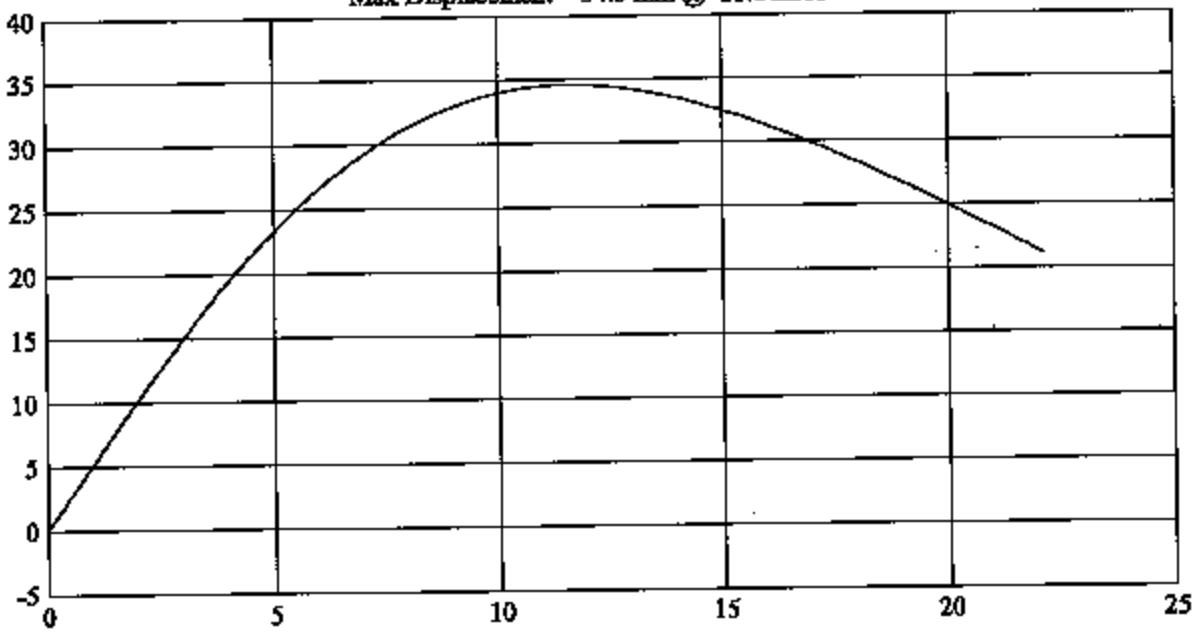
Vehicle Program : Outback

Test Date: 12/1/04

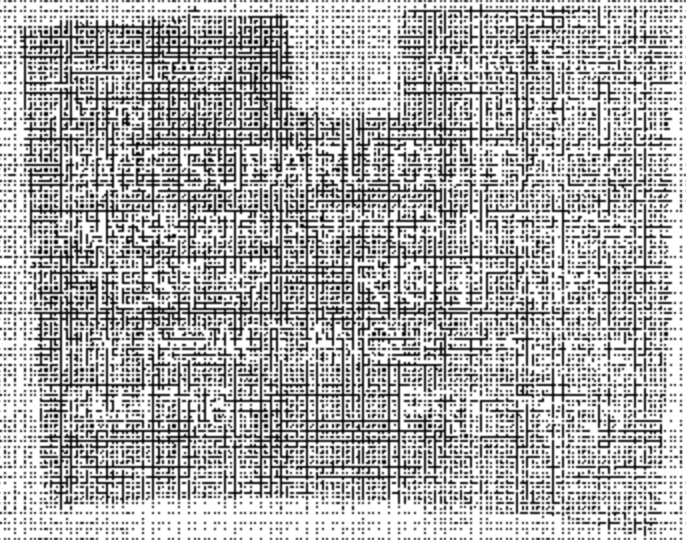
Model Year: 2005
Target: AP2
Vehicle Side: Left
Horz/Vert Angle: 204/46

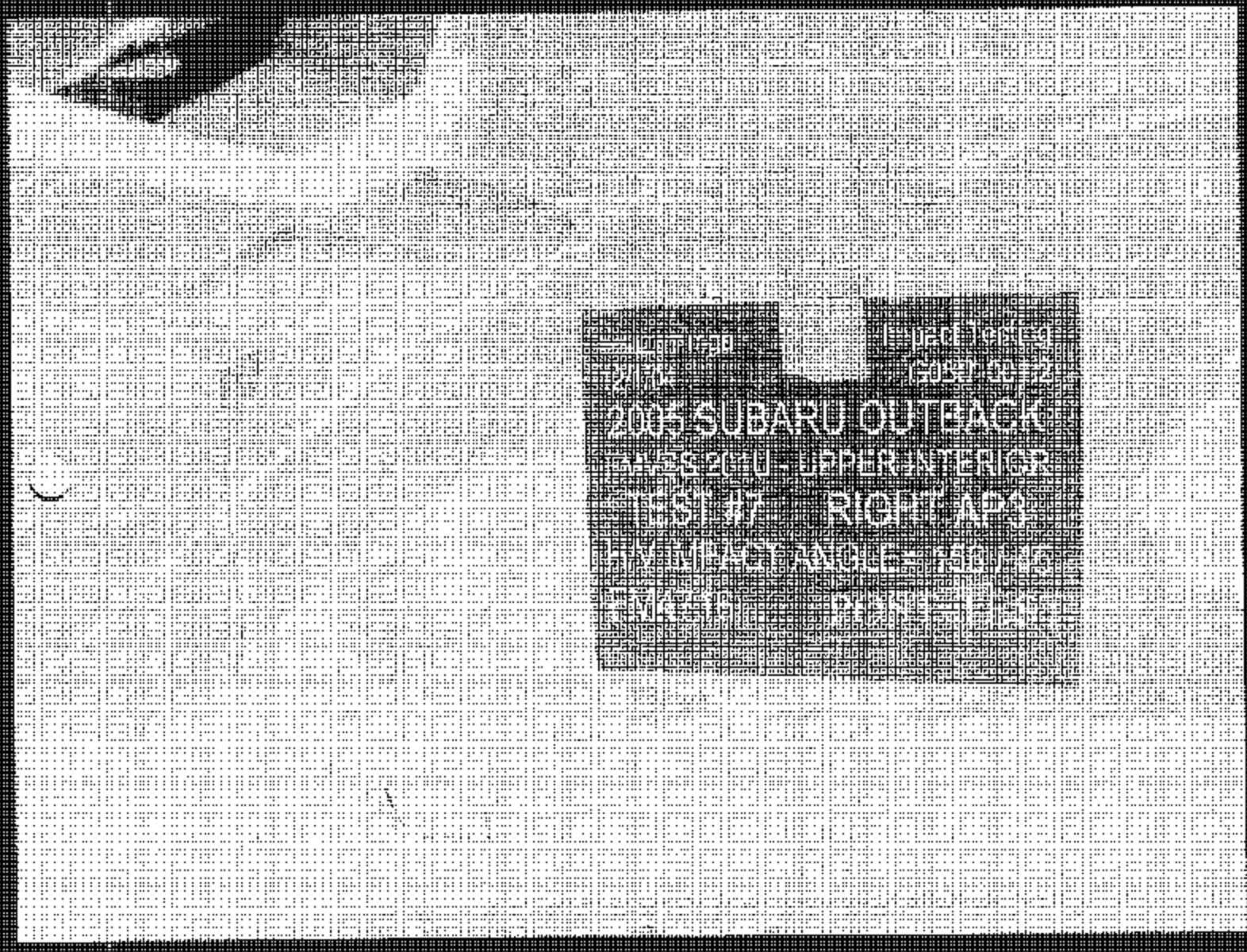
HIC(d) = 334, HIC = 222, Delta T = 11.6 msec

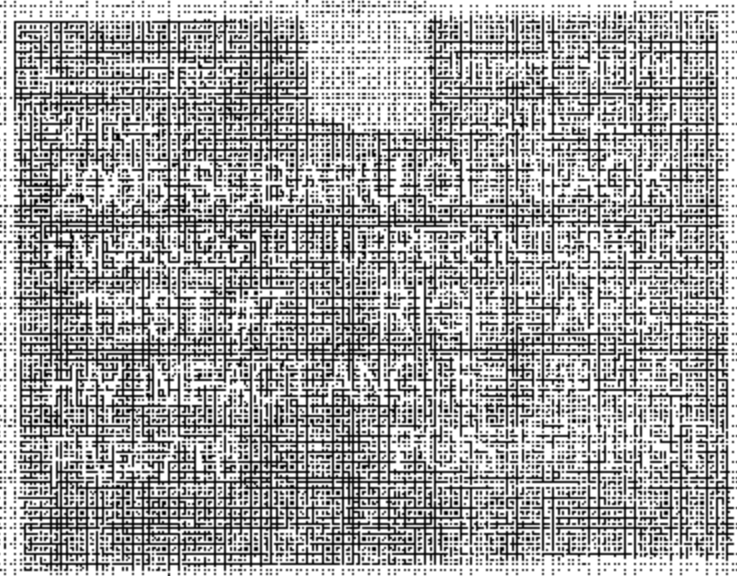
Max Displacement = 34.5 mm @ 11.6 msec



Displacement (mm) vs. Time (msec)




2005 SUBARU OUTBACK
2.5i 2.5i LIMITED 3.0R
2.5i 2.5i LIMITED 3.0R



SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G05I7-001.2 VEHICLE YR/MAKE/MODEL:2005/Subaru/Outback

GENERAL TEST PARAMETERS:

Target (Vehicle Side): AP3 Right

MGA Test Reference No.:FM4716

Approach Horizontal Angles:156°

Approach Vertical Angles:45°

Additional Description:

Test Number:#7

Temperature:21C

Humidity:31%

Time of Test:9:08 AM

FMH Serial No:035

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
322	206	14.2	19.4	17	0

INSTRUMENTAION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35924	-94.1	1.44	1.44
Y	6	J35919	94.3	1.54	1.54
Z	7	J22664	92.7	1.17	1.17

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage

Recorded By: _____ Approved By*: _____ Date: 12/1/04

*Only necessary for NHTSA (Government) Compliance testing.

FMH
G05I7-001.2

Customer: Subaru
Test # 7
FM4716
Additional Desc: N/A

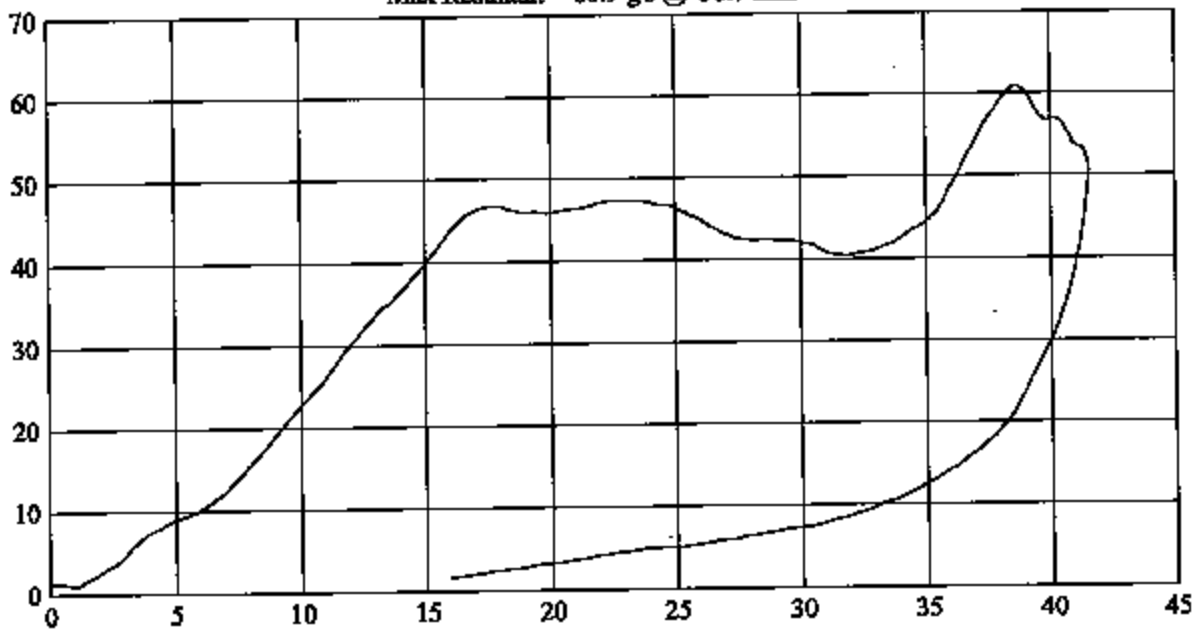
Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005
Target: AP3
Vehicle Side: Right
Horz/Vert Angle: 156/45

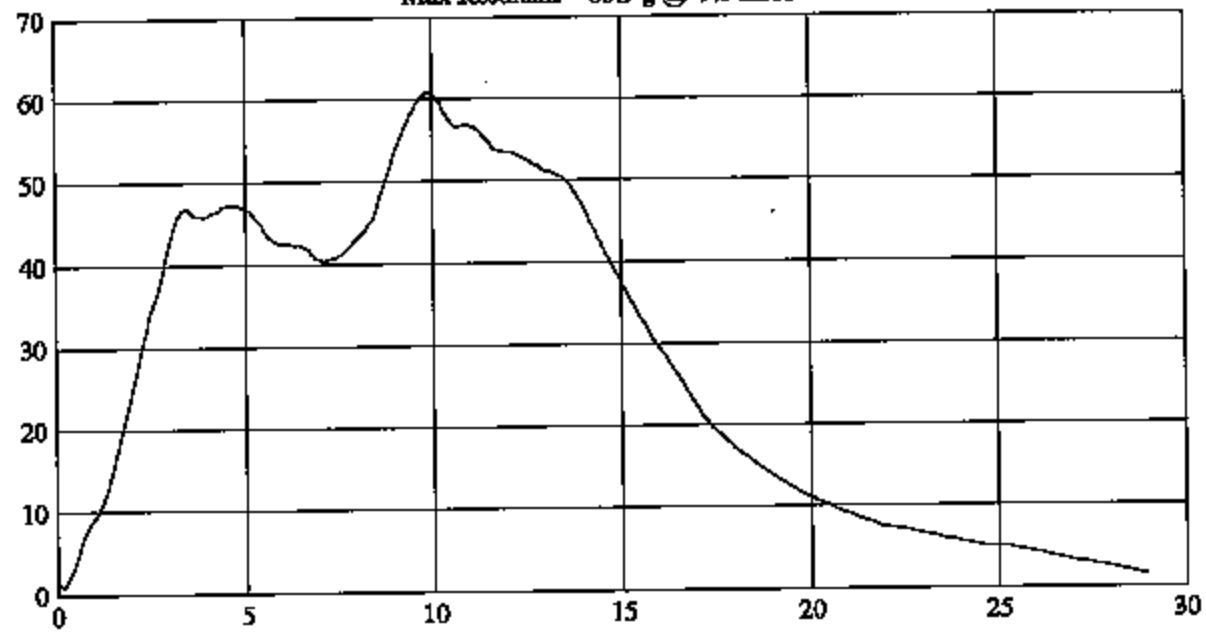
HIC(d) = 322, HIC = 206, Delta T = 14.2 msec

Max Resultant = 60.9 g's @ 38.7 mm



Resultant (g's) vs. Displacement (mm)

Max Resultant = 60.9 g @ 9.9 msec



Resultant Accel (g's) vs. Time (msec)

FMH
G05I7-001.2

Customer: Subaru
Test # 7
FM4716
Additional Desc: N/A

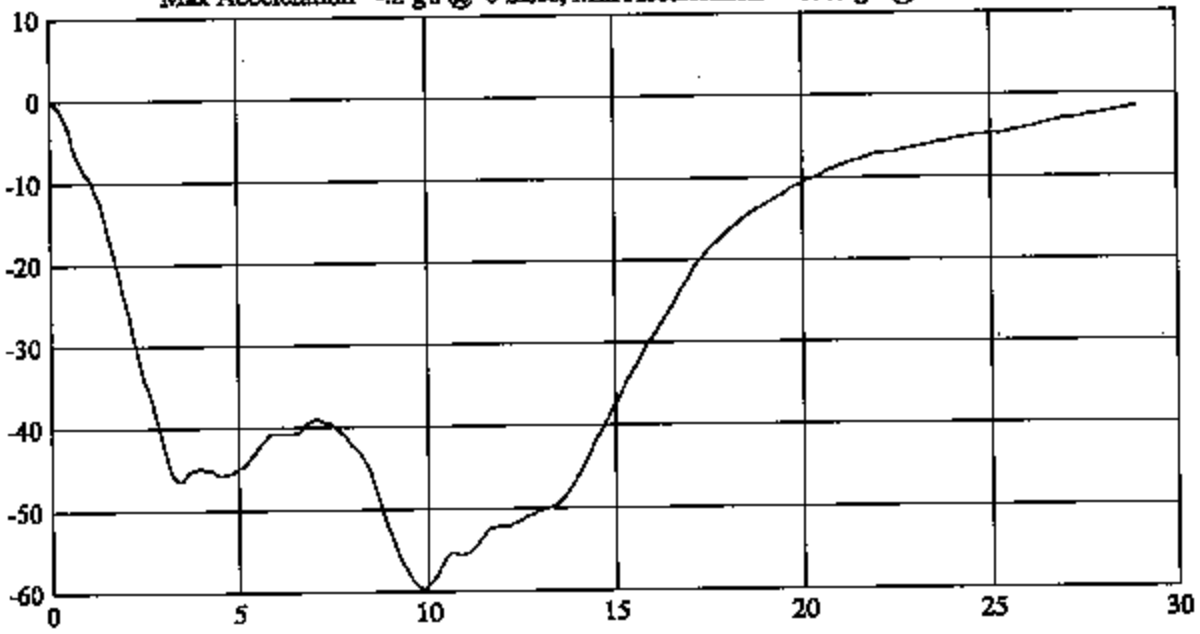
Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005
Target: AP3
Vehicle Side: Right
Horz/Vert Angle: 156/45

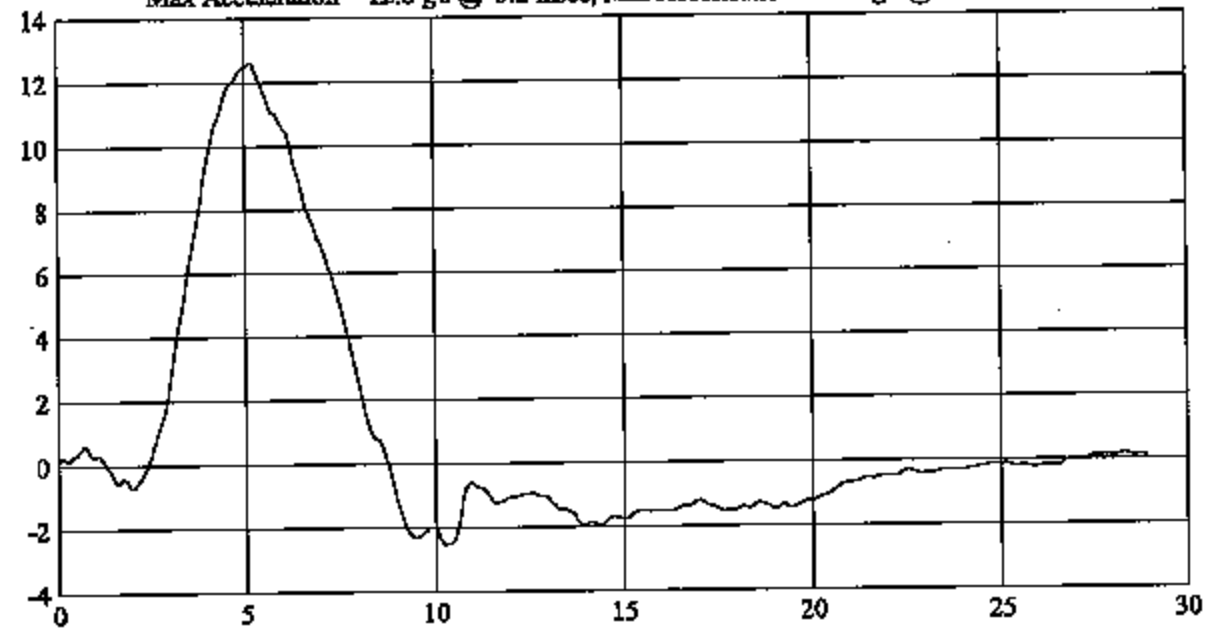
HIC(d) = 322, HIC = 206, Delta T = 14.2 msec

Max Acceleration = .2 g's @ 0 msec, Min Acceleration = -59.8 g's @ 9.9 msec



Accel X (g's) vs. Time (msec)

Max Acceleration = 12.6 g's @ 5.2 msec, Min Acceleration = -2.6 g's @ 10.2 msec



Accel Y (g's) vs. Time (msec)

FMH
G05I7-001.2

Customer: Subaru
Test # 7
FM4716
Additional Desc: N/A

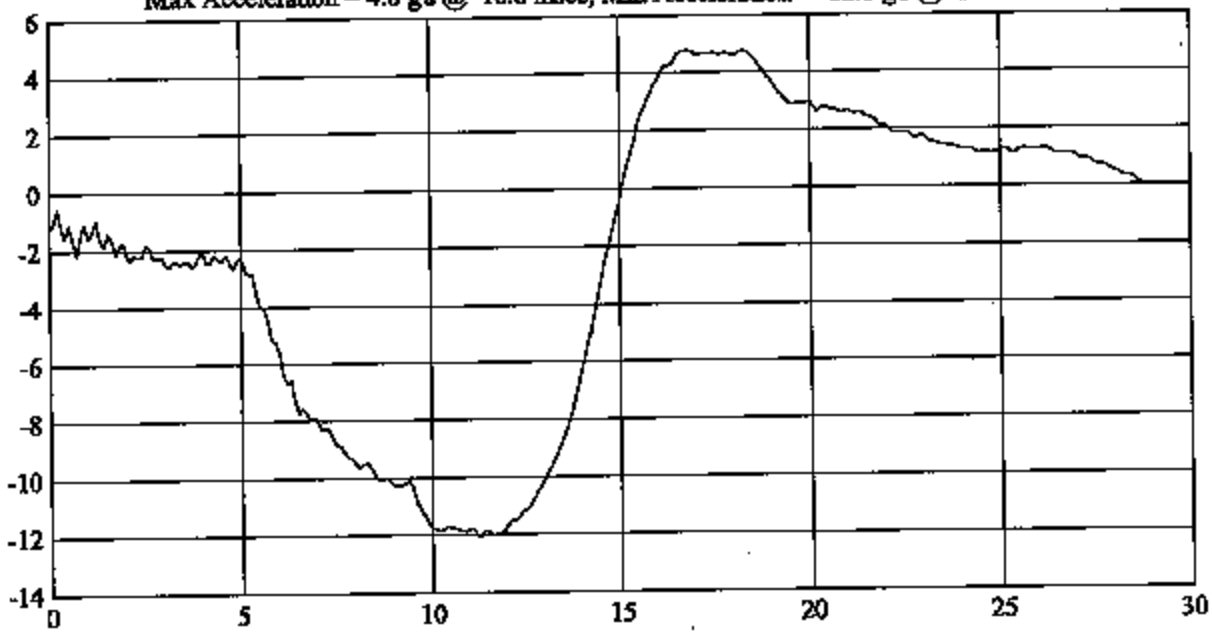
Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005
Target: AP3
Vehicle Side: Right
Horz/Vert Angle: 156/45

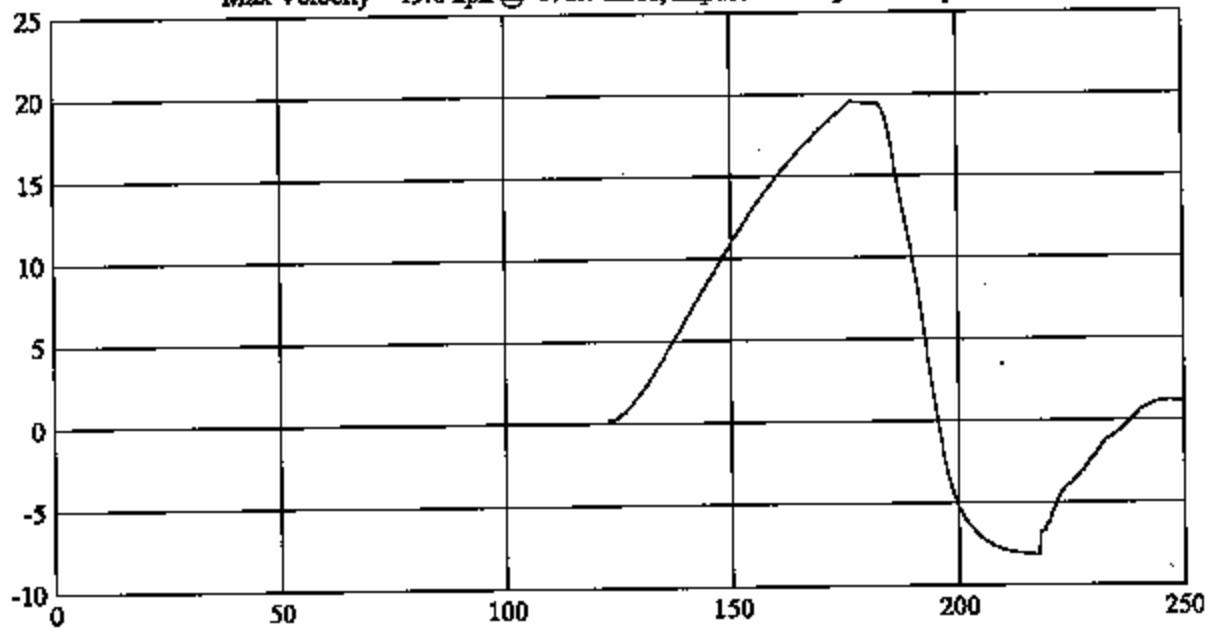
HIC(d) = 322, HIC = 206, Delta T = 14.2 msec

Max Acceleration = 4.8 g's @ 16.8 msec, Min Acceleration = -12.1 g's @ 11.2 msec



Accel Z (g's) vs. Time (msec)

Max Velocity = 19.6 kph @ 176.7 msec, Impact Velocity = 19.4 kph



Velocity (kph) vs. Time (msec)

FMH
G0517-001.2

Customer: Subaru
Test # 7
FM4716
Additional Desc: N/A

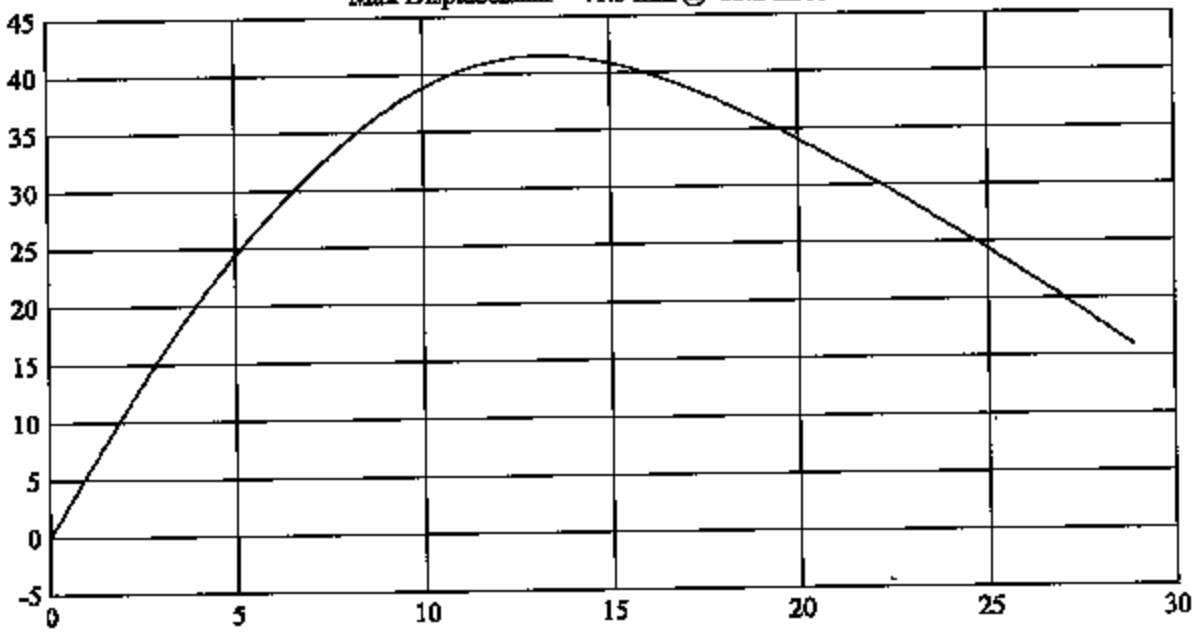
Vehicle Program : Outback

Test Date: 12/1/04

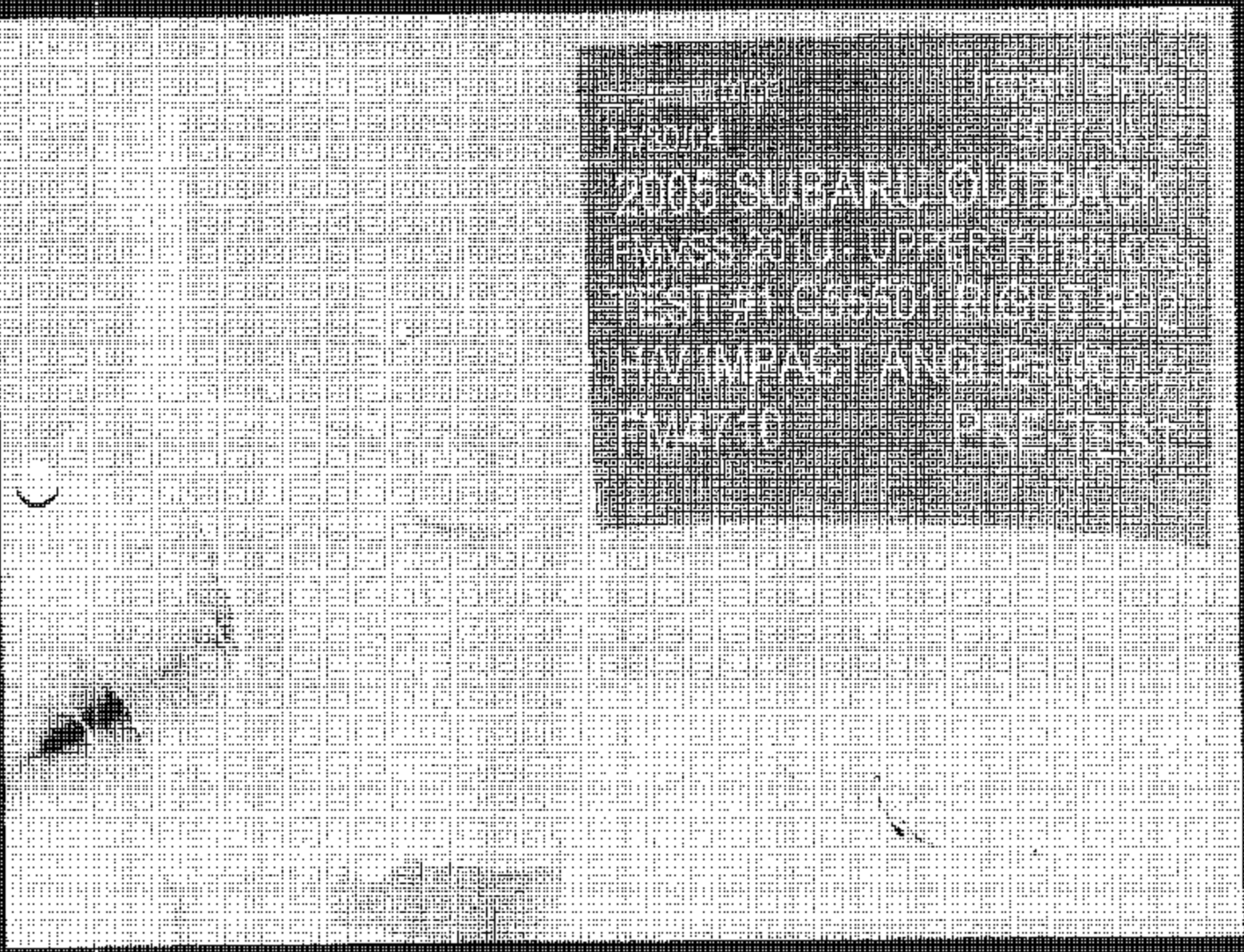
Model Year: 2005
Target: AP3
Vehicle Side: Right
Horz/Vert Angle: 156/45

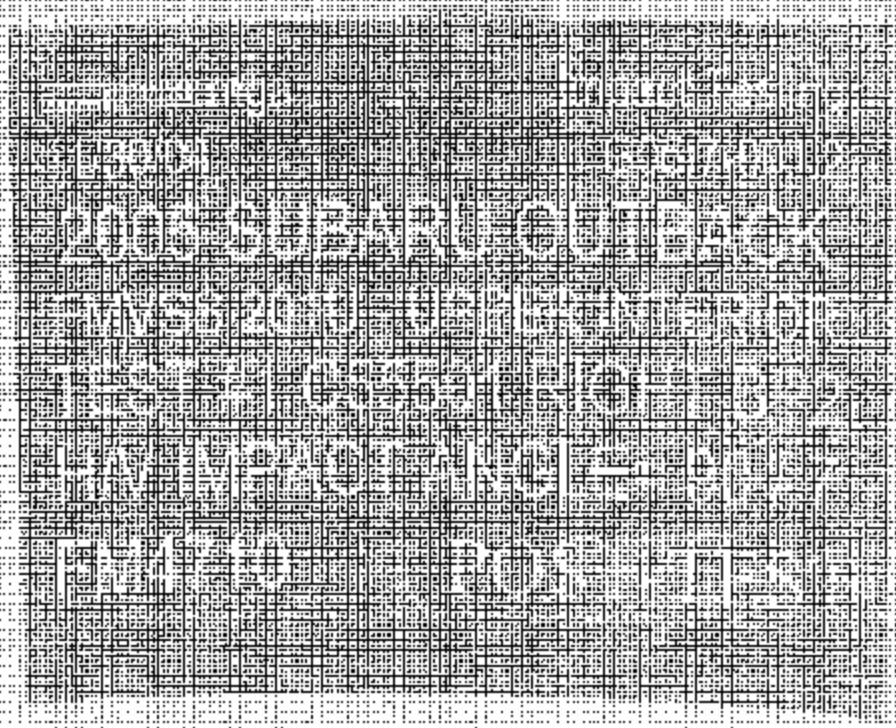
HIC(d) = 322, HIC = 206, Delta T = 14.2 msec

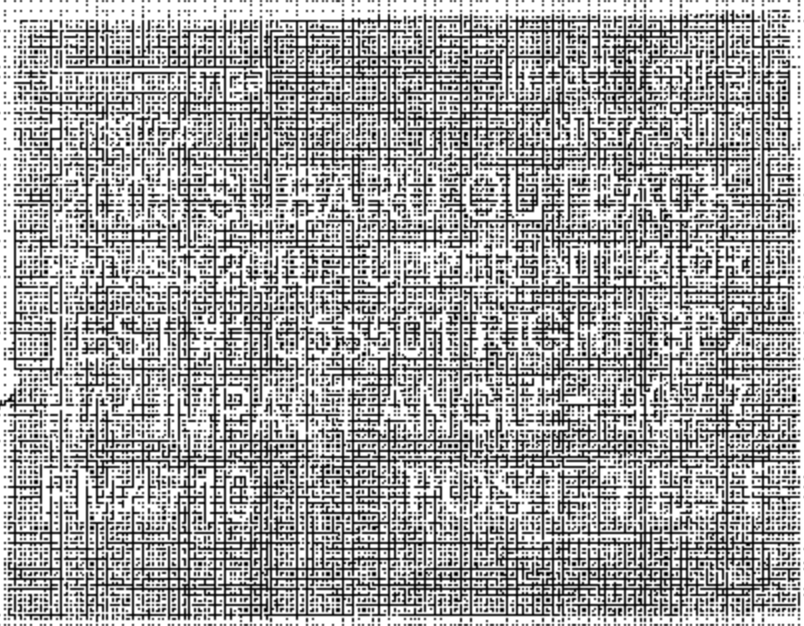
Max Displacement = 41.5 mm @ 13.2 msec



Displacement (mm) vs. Time (msec)







MICHIGAN OPERATIONS
DATE: 2/8/01
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3
REVISION NO.: 2
PAGE 1 OF 1

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G05I7-001.2 VEHICLE YR/MAKE/MODEL:2005/Subaru/Outback

GENERAL TEST PARAMETERS:

Target (Vehicle Side): BP2 Right

MGA Test Reference No.:FM4710

Approach Horizontal Angles:90°

Approach Vertical Angles:7°

Additional Description:

Test Number:#1

Temperature:22C

Humidity:31%

Time of Test:12:00 PM

FMH Serial No:035

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
635	621	9.3	23.6	10	20 L

INSTRUMENTAION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35924	-94.1	1.44	1.43
Y	6	J35919	94.3	1.54	1.54
Z	7	J22664	92.7	1.17	1.15

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage

Recorded By: _____ Approved By*: _____ Date: 11/30/04

*Only necessary for NHTSA (Government) Compliance testing.

FMH
G05I7-001.2

Customer: Subaru
Test # 1
FM4710
Additional Desc: N/A

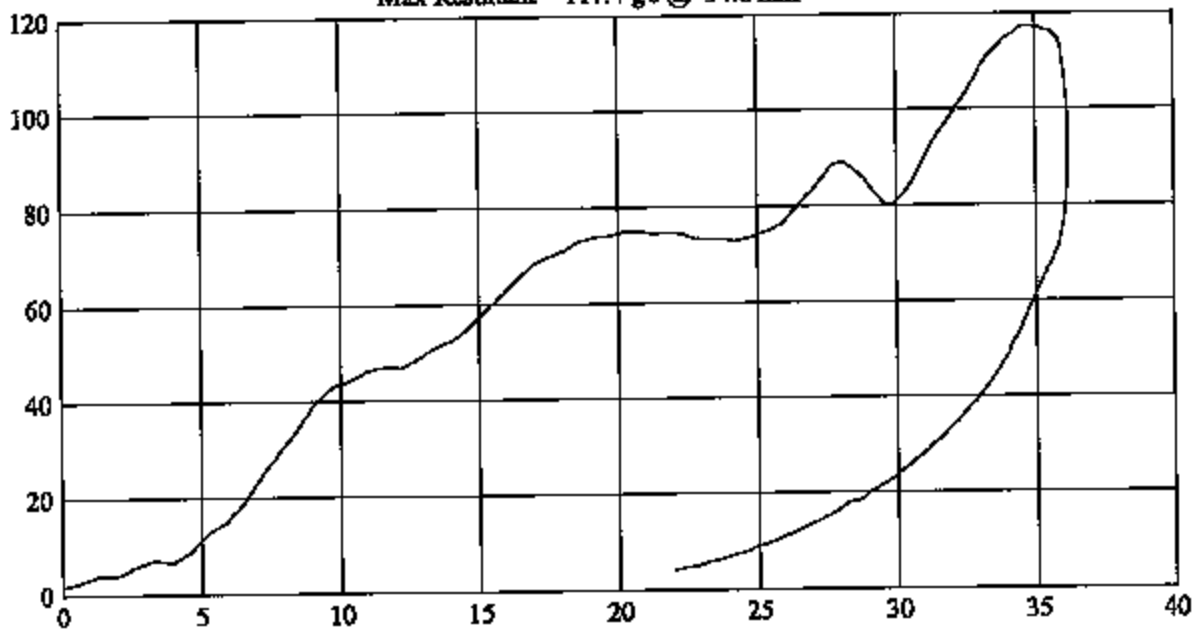
Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005
Target: BP2
Vehicle Side: Right
Horz/Vert Angle: 90/7

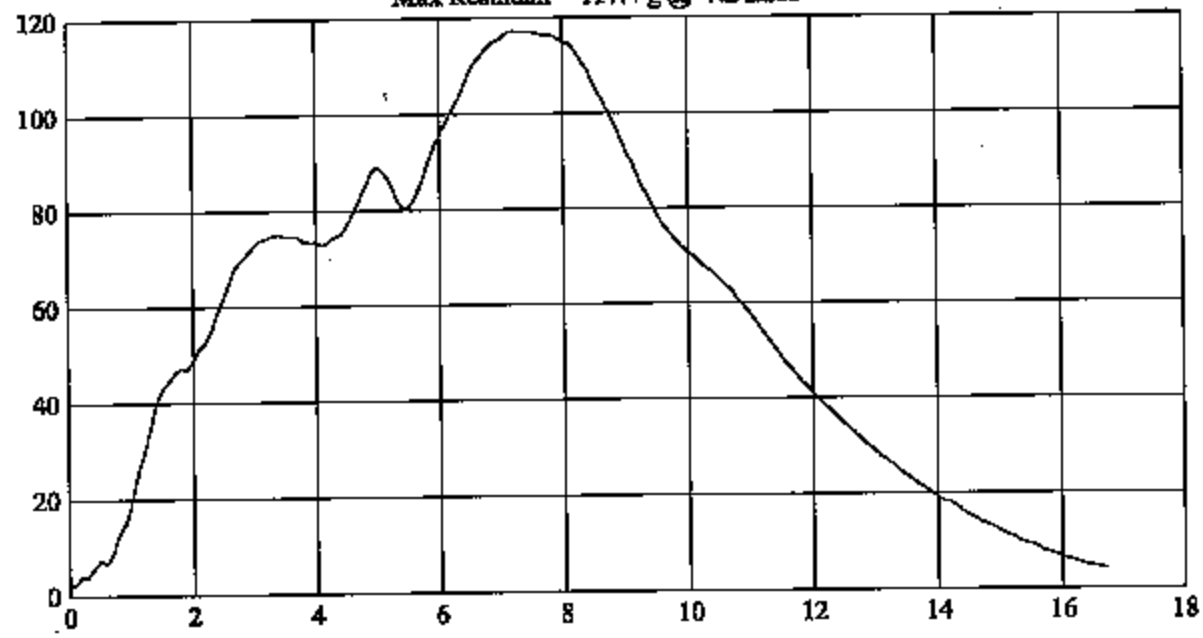
HIC(d) = 635, HIC = 621, Delta T = 9.3 msec

Max Resultant = 117.4 g's @ 34.6 mm



Resultant (g's) vs. Displacement (mm)

Max Resultant = 117.4 g @ 7.2 msec



Resultant Accel (g's) vs. Time (msec)

Customer: Subaru
Test # 1
FM4710
Additional Desc: N/A

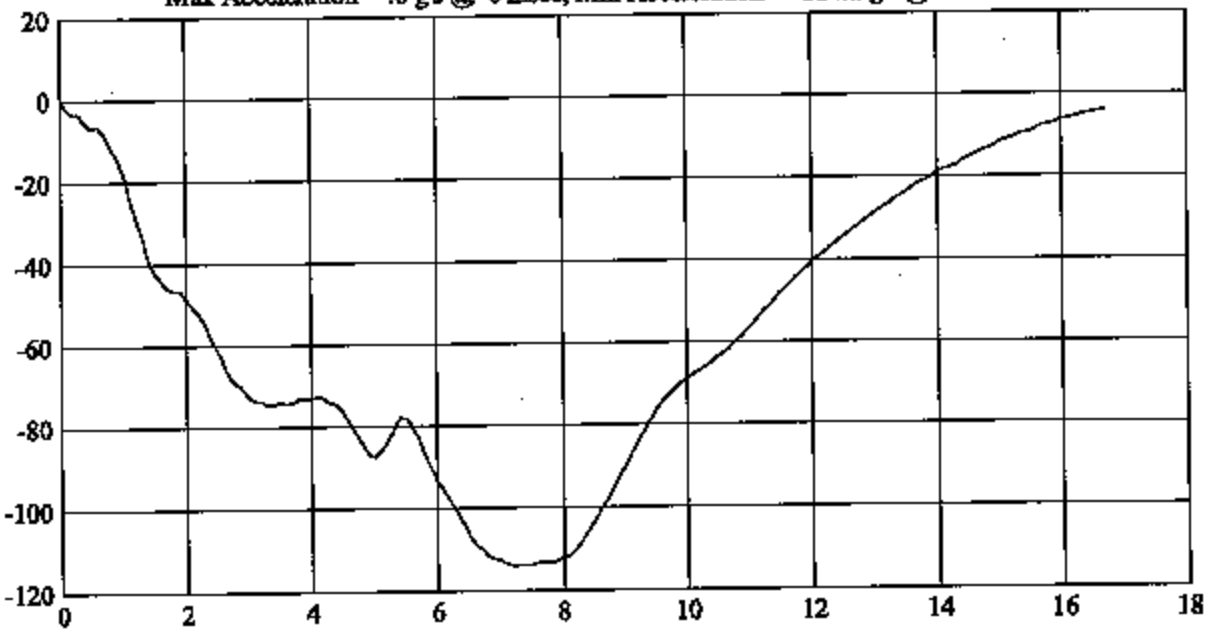
Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005
Target: BP2
Vehicle Side: Right
Horz/Vert Angle: 90/7

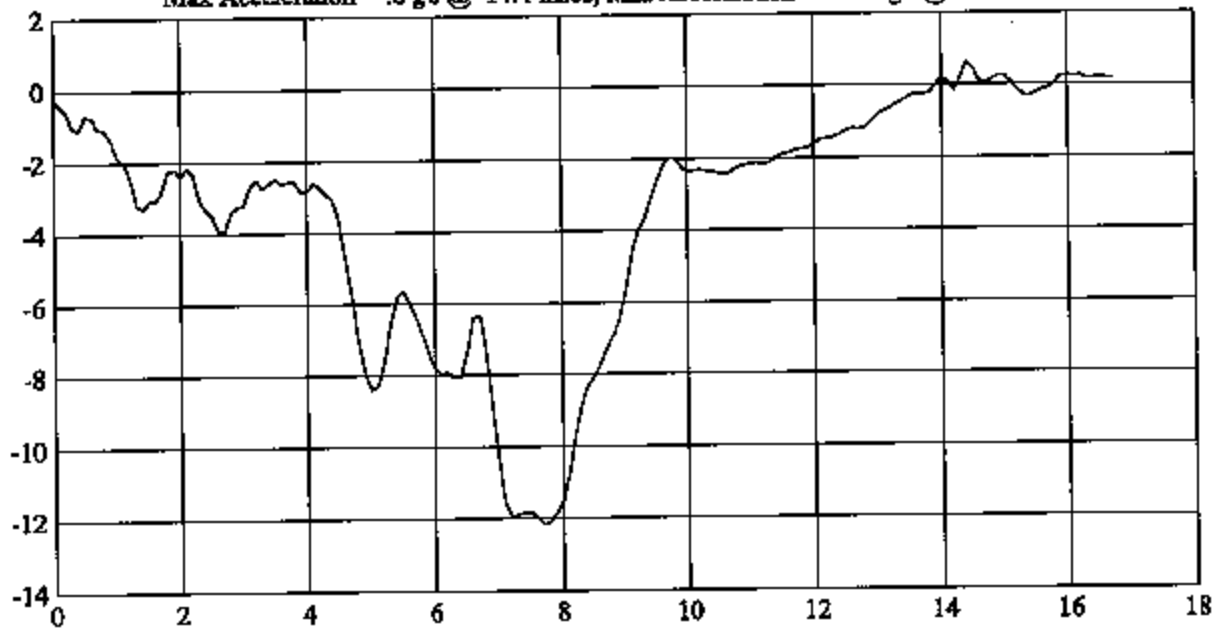
HIC(d) = 635, HIC = 621, Delta T = 9.3 msec

Max Acceleration = .6 g's @ 0 msec, Min Acceleration = -114.1 g's @ 7.2 msec



Accel X (g's) vs. Time (msec)

Max Acceleration = .6 g's @ 14.4 msec, Min Acceleration = -12.2 g's @ 7.7 msec



Accel Y (g's) vs. Time (msec)

Customer: Subaru
Test # 1
FM4710
Additional Desc: N/A

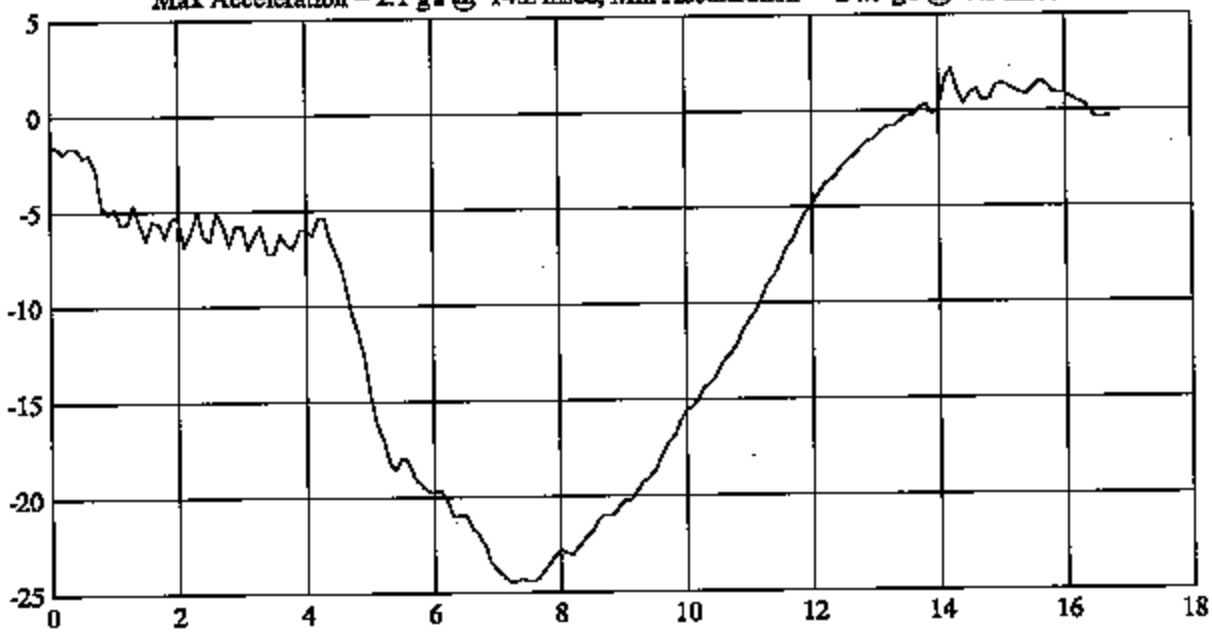
Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005
Target: BP2
Vehicle Side: Right
Horz/Vert Angle: 90/7

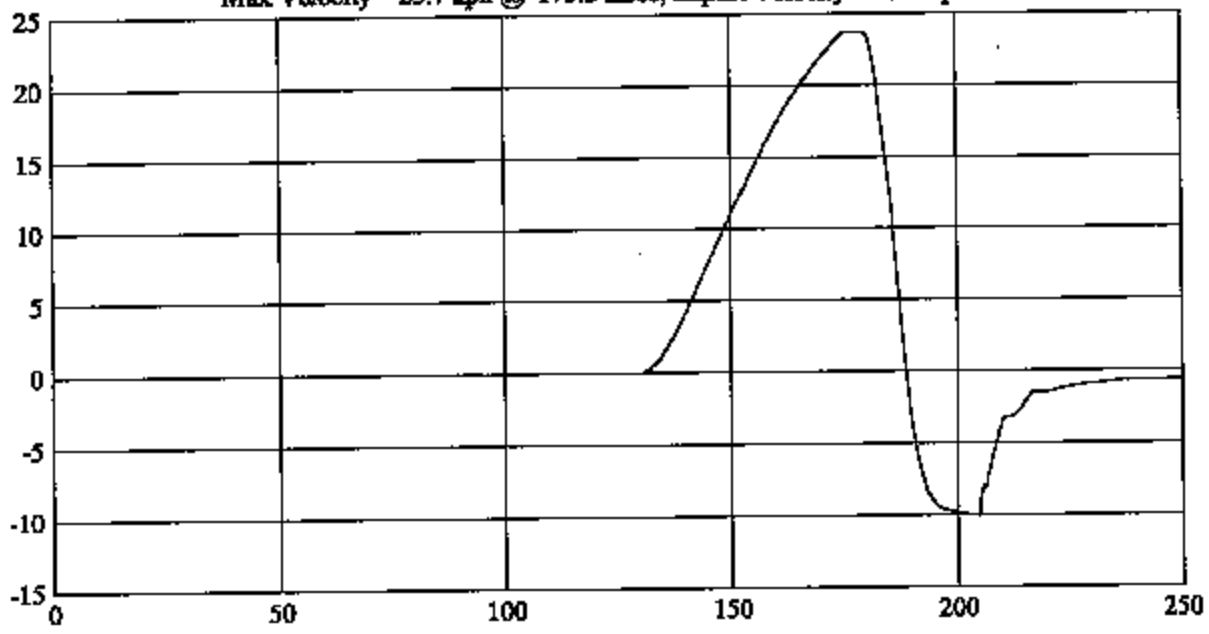
HIC(d) = 635, HIC = 621, Delta T = 9.3 msec

Max Acceleration = 2.1 g's @ 14.2 msec, Min Acceleration = -24.5 g's @ 7.3 msec



Accel Z (g's) vs. Time (msec)

Max Velocity = 23.7 kph @ 175.5 msec, Impact Velocity = 23.6 kph



Velocity (kph) vs. Time (msec)

FMH
G05I7-001.2

Customer: Subaru
Test # 1
FM4710
Additional Desc: N/A

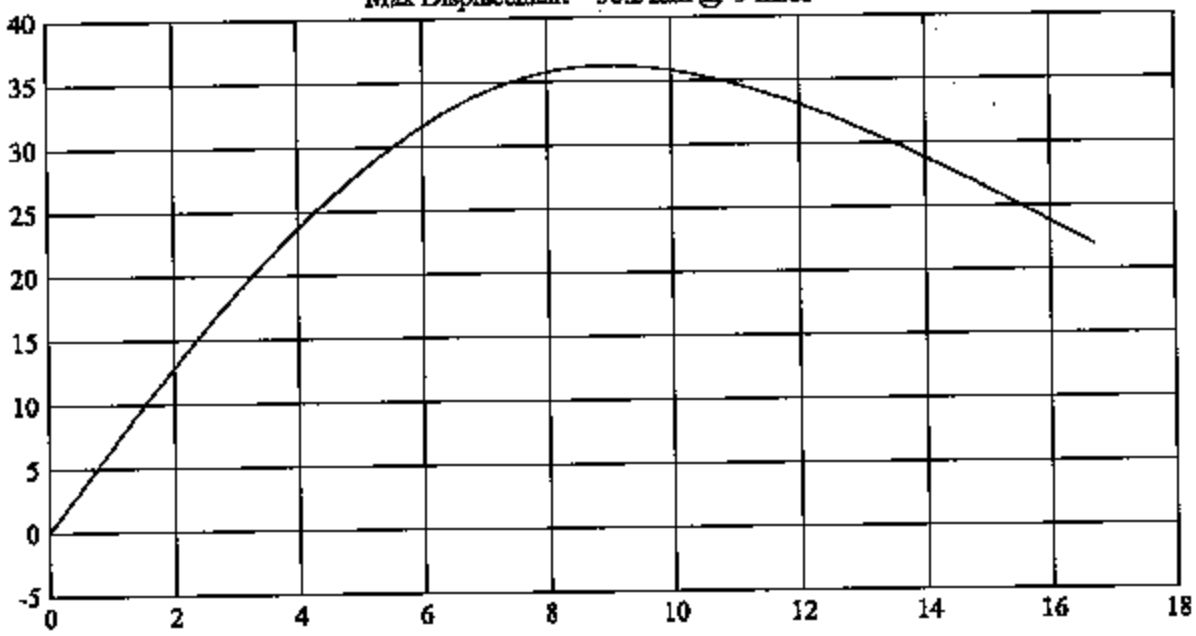
Vehicle Program : Outback

Test Date: 11/30/04

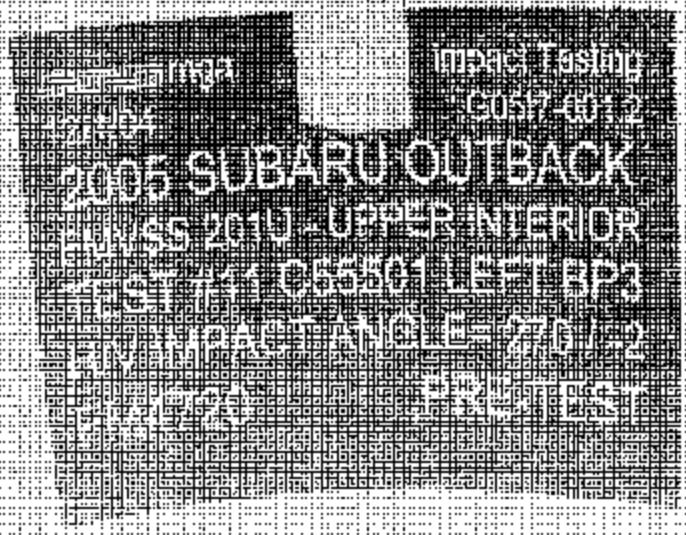
Model Year: 2005
Target: BP2
Vehicle Side: Right
Horz/Vert Angle: 90/7

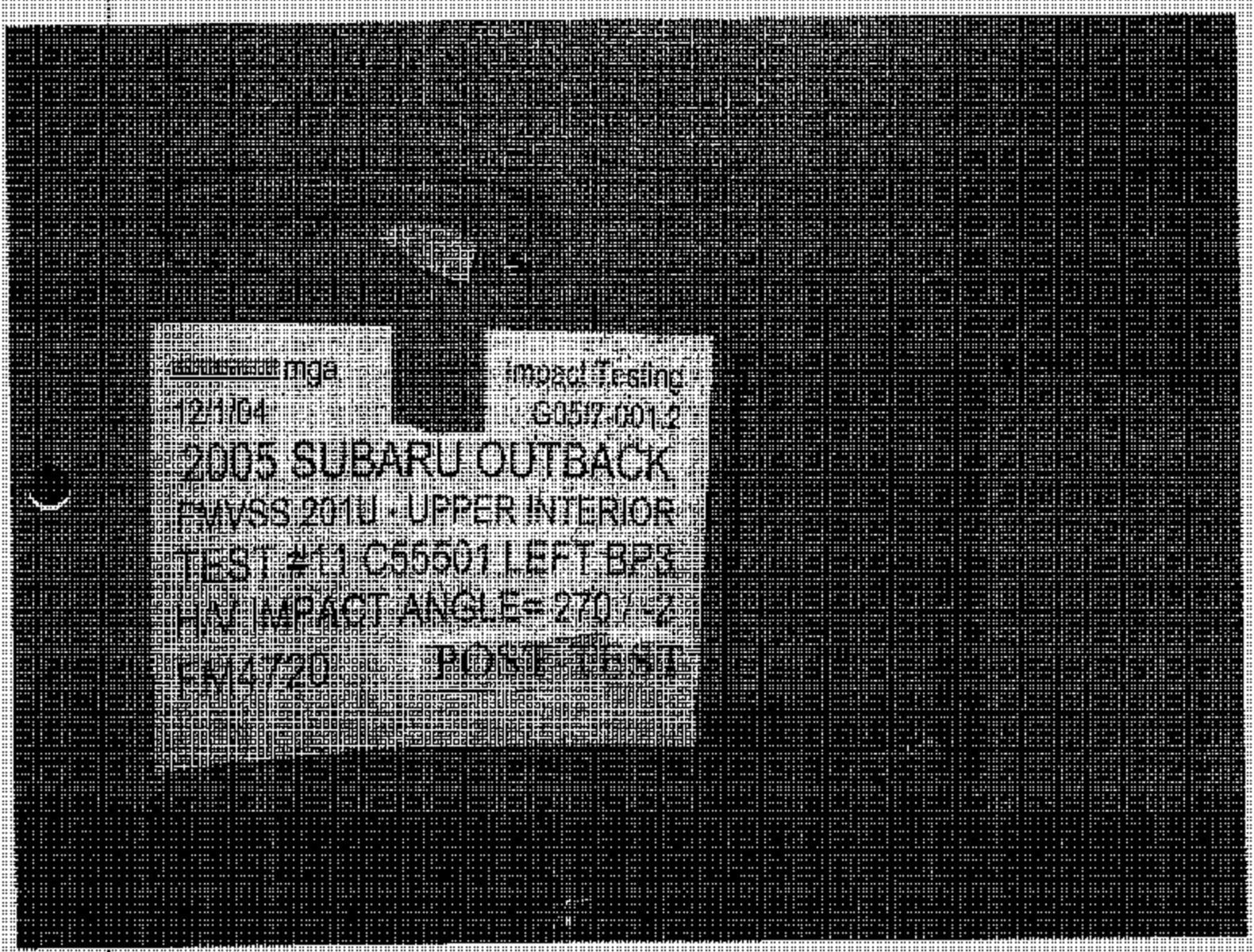
HIC(d) = 635, HIC = 621, Delta T = 9.3 msec

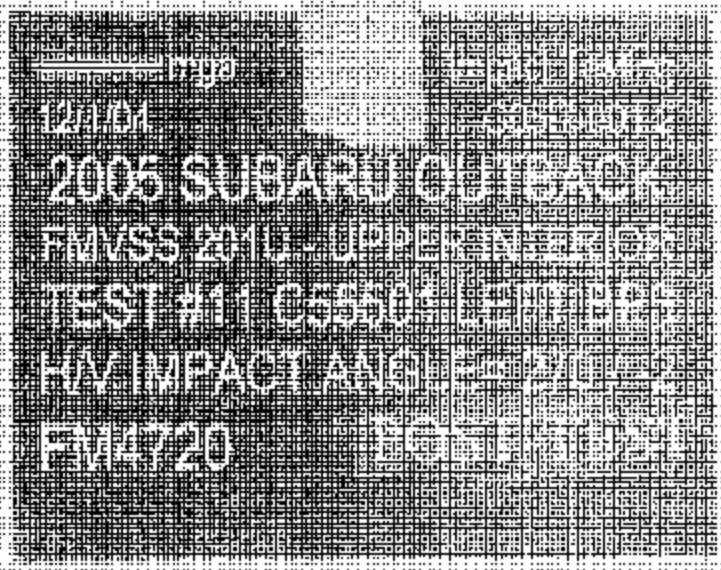
Max Displacement = 36.2 mm @ 9 msec



Displacement (mm) vs. Time (msec)


2005 SUBARU OUTBACK
2.5 S 2010 UPPER INTERIOR


mga
121104
Impact Testing
G0512.0012
2005 SUBARU OUTBACK
FMVSS 201U - UPPER INTERIOR
TEST #11 C6560I LEFT BPS
FNI IMPACT ANGLE= 270 +/- 2
FN14720
POST TEST


2006 SUBARU
FORESTER
TEST FIT
HAYNES FACTAN

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G05I7-001.2 VEHICLE YR/MAKE/MODEL:2005/Subaru/Outback

GENERAL TEST PARAMETERS:

Target (Vehicle Side): BP3 Left

MGA Test Reference No.:FM4720

Approach Horizontal Angles:270°

Approach Vertical Angles:-2°

Additional Description:

Test Number:#11

Temperature:21C

Humidity:25%

Time of Test:4:32 PM

FMH Serial No:035

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
594	567	9.3	23.8	20	37 L

INSTRUMENTAION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35924	-94.1	1.44	1.44
Y	6	J35919	94.3	1.54	1.54
Z	7	J22664	92.7	1.18	1.16

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage.

Recorded By: _____ Approved By*: _____ Date: 12/1/04

*Only necessary for NHTSA (Government) Compliance testing.

FMH
G05I7-001.2

Customer: Subaru
Test # 11
FM4720
Additional Desc: N/A

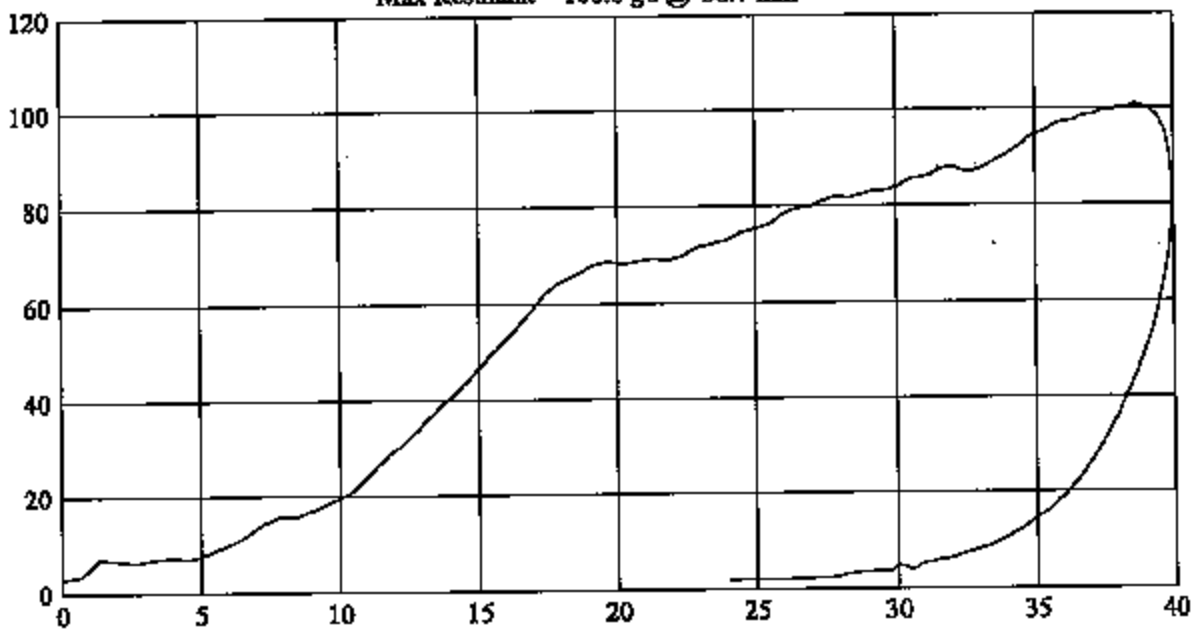
Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005
Target: BP3
Vehicle Side: Left
Horz/Vert Angle: 270/-2

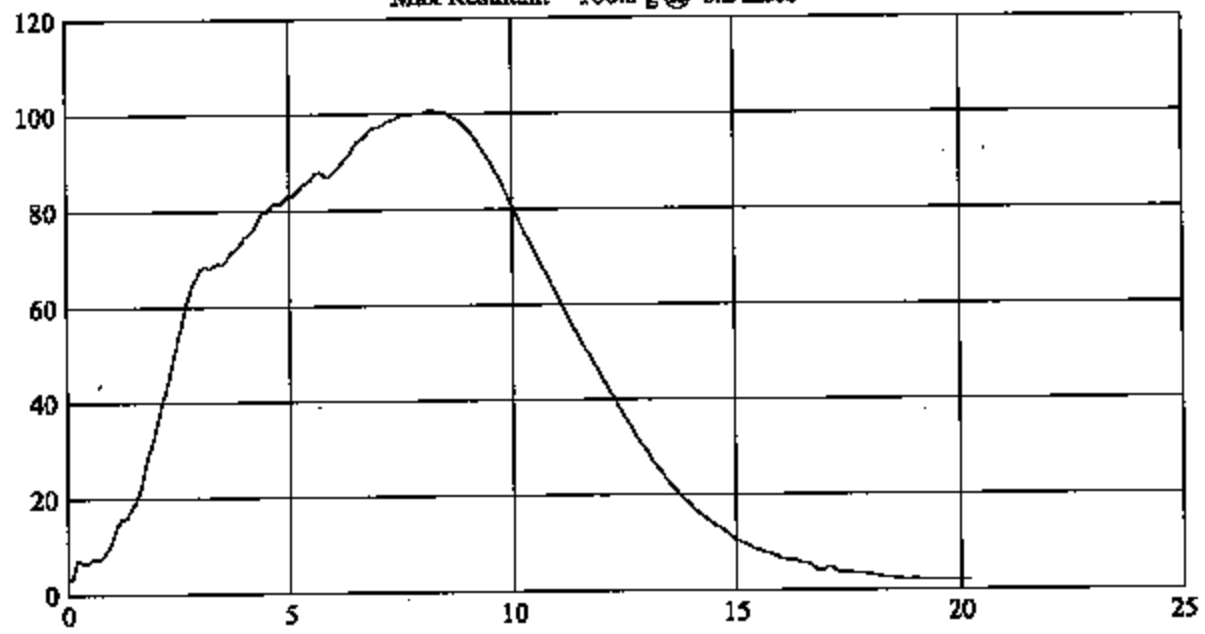
HIC(d) = 594, HIC = 567, Delta T = 9.3 msec

Max Resultant = 100.8 g's @ 38.7 mm



Resultant (g's) vs. Displacement (mm)

Max Resultant = 100.8 g @ 8.2 msec



Resultant Accel (g's) vs. Time (msec)

Customer: Subaru
Test # 11
FM4720
Additional Desc: N/A

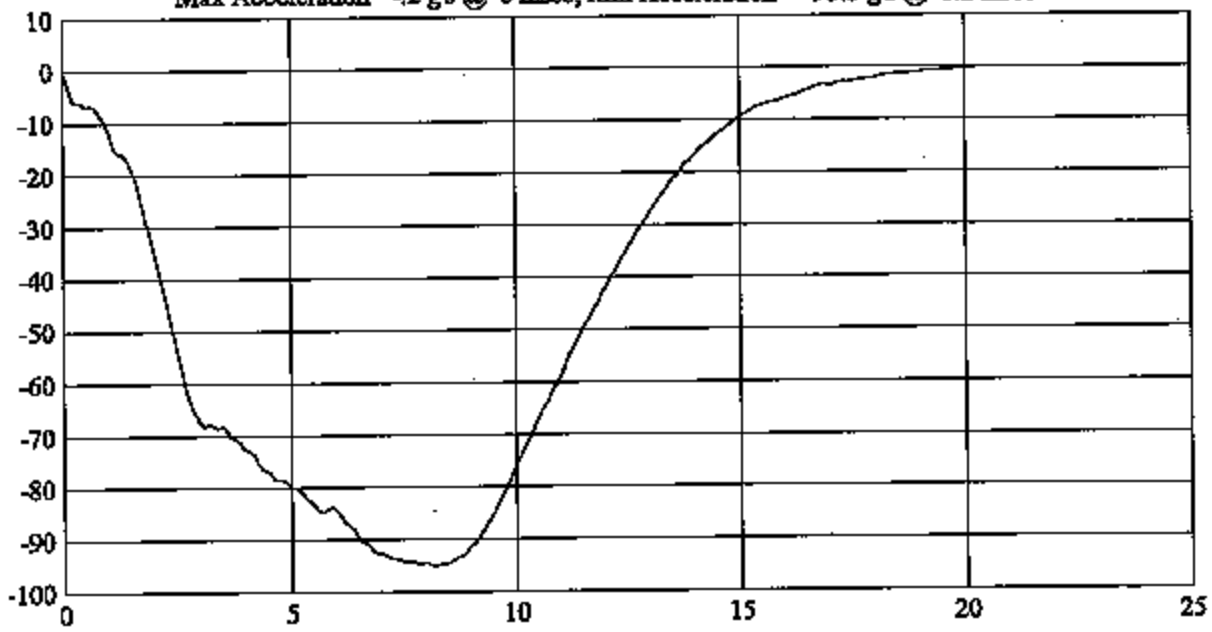
Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005
Target: BP3
Vehicle Side: Left
Horz/Vert Angle: 270/-2

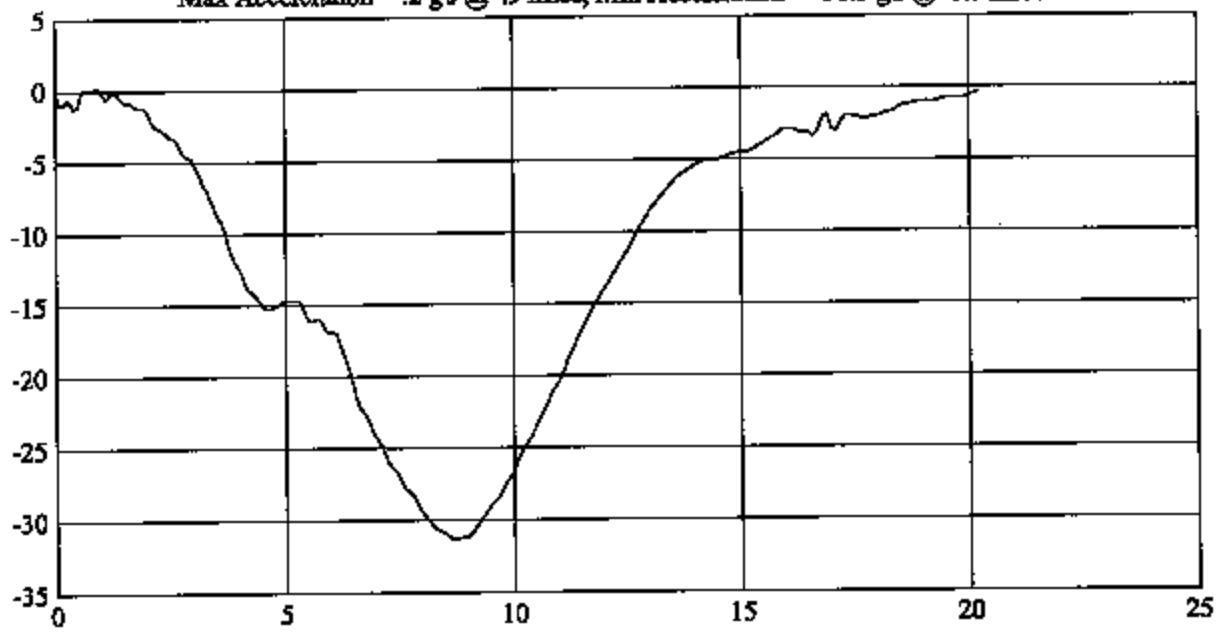
HIC(d) = 594, HIC = 567, Delta T = 9.3 msec

Max Acceleration =-.2 g's @ 0 msec, Min Acceleration = -95.3 g's @ 8.2 msec



Accel X (g's) vs. Time (msec)

Max Acceleration = .2 g's @ .9 msec, Min Acceleration = -31.3 g's @ 8.7 msec



Accel Y (g's) vs. Time (msec)

FMH
G05T7-001.2

Customer: Subaru
Test # 11
FM4720
Additional Desc: N/A

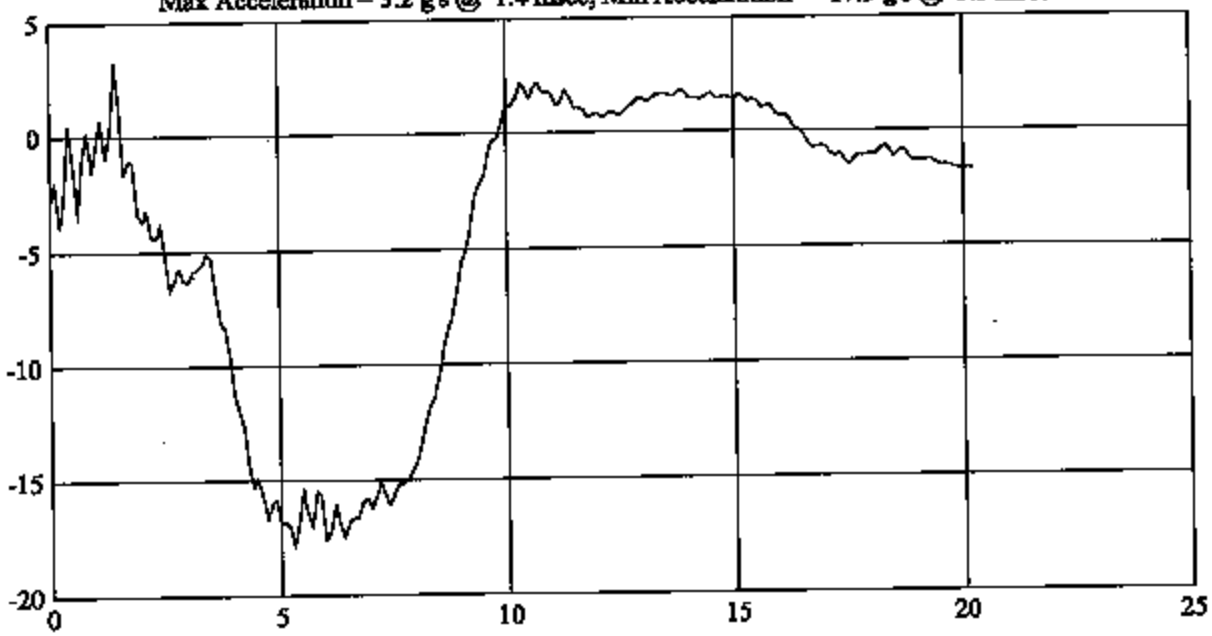
Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005
Target: BP3
Vehicle Side: Left
Horz/Vert Angle: 270/-2

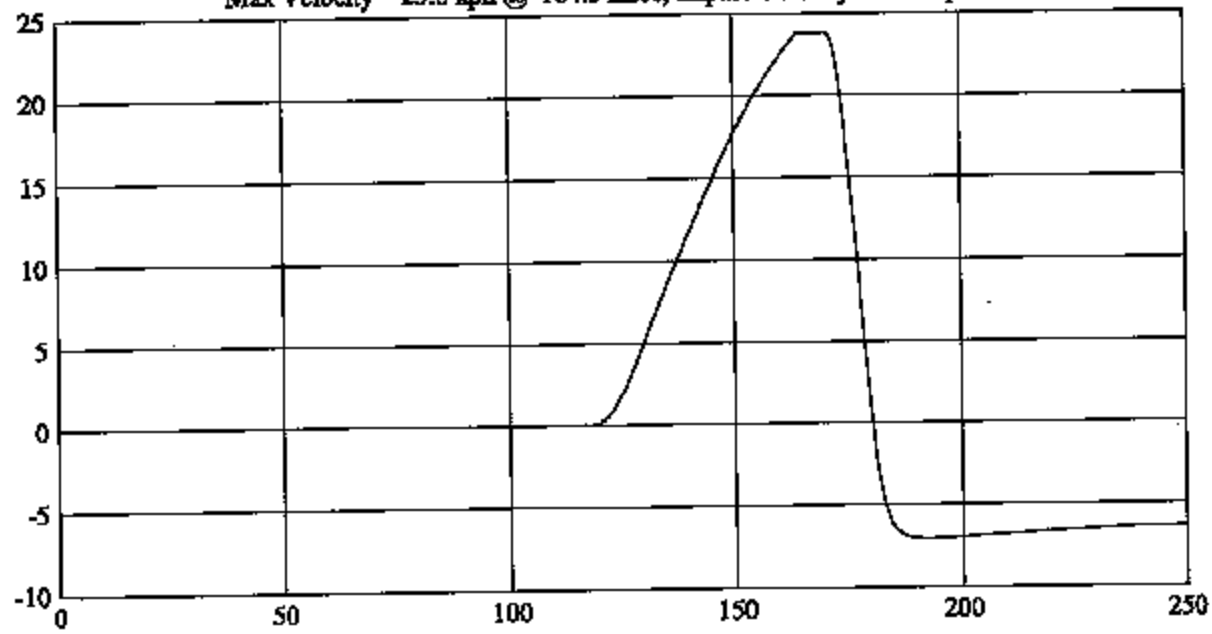
HIC(d) = 594, HIC = 567, Delta T = 9.3 msec

Max Acceleration = 3.2 g's @ 1.4 msec, Min Acceleration = -17.9 g's @ 5.3 msec



Accel Z (g's) vs. Time (msec)

Max Velocity = 23.8 kph @ 164.3 msec, Impact Velocity = 23.8 kph



Velocity (kph) vs. Time (msec)

FMH
G05I7-001.2

Customer: Subaru
Test # 11
FM4720
Additional Desc: N/A

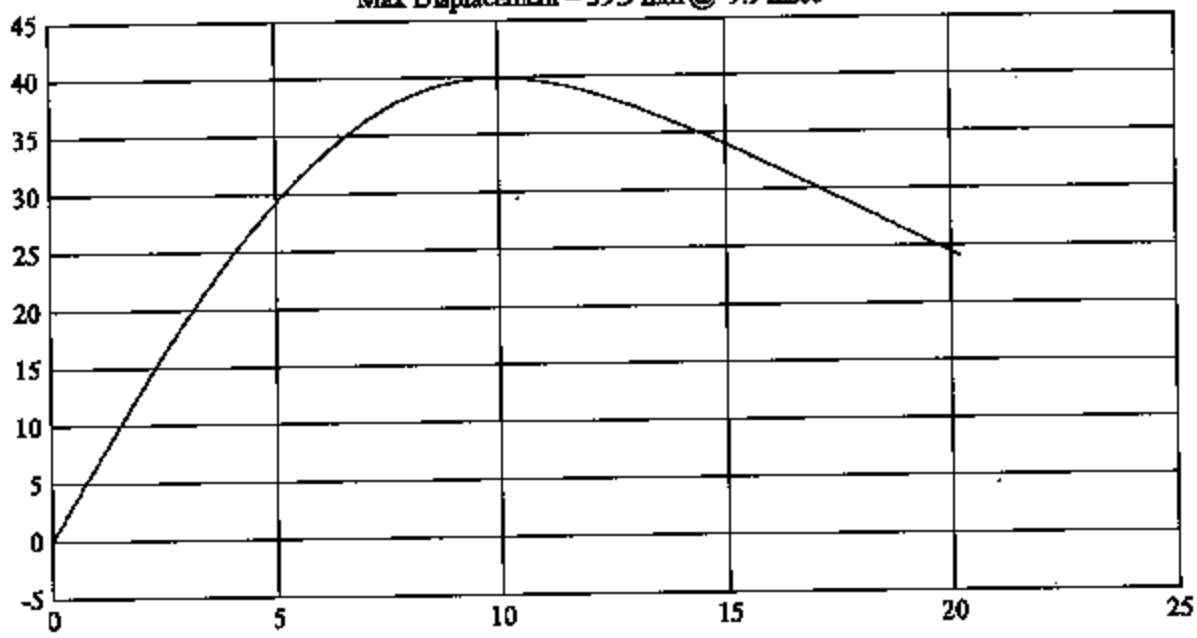
Vehicle Program : Outback

Test Date: 12/1/04

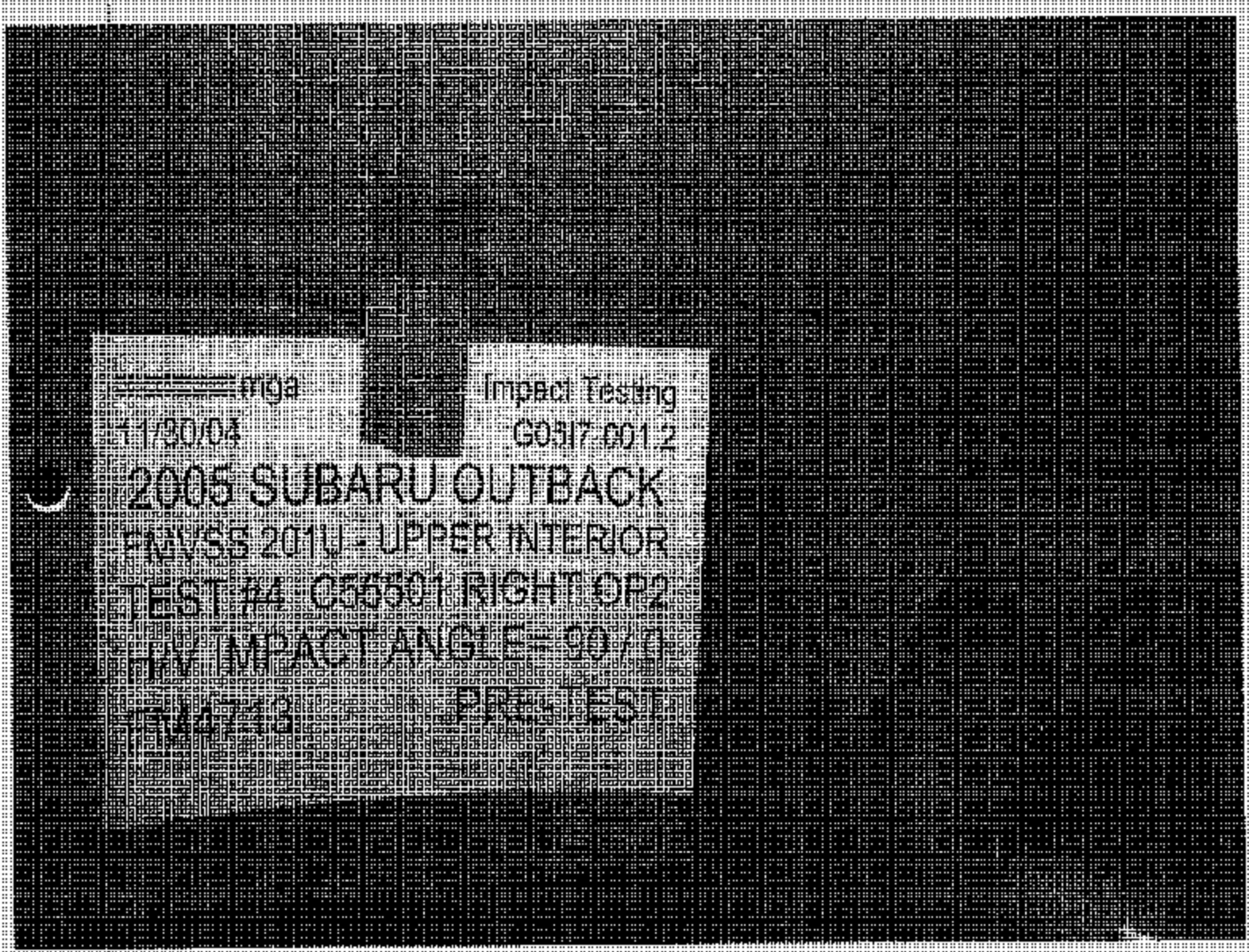
Model Year: 2005
Target: BP3
Vehicle Side: Left
Horz/Vert Angle: 270/-2

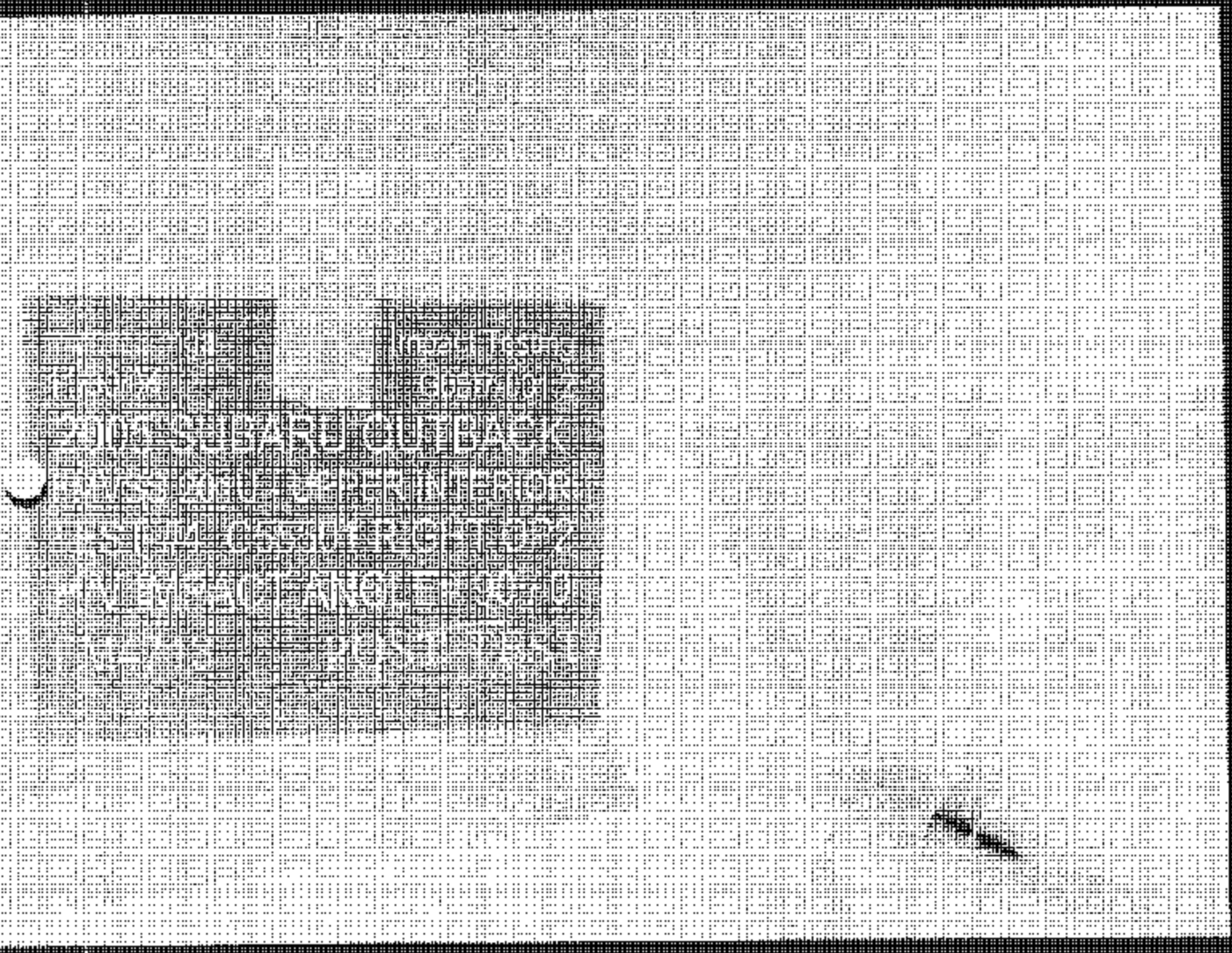
HIC(d) = 594, HIC = 567, Delta T = 9.3 msec

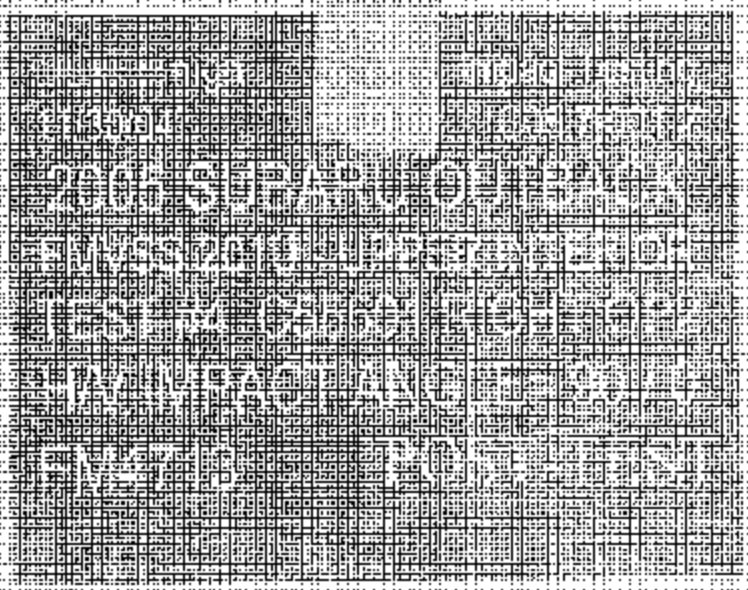
Max Displacement = 39.9 mm @ 9.9 msec



Displacement (mm) vs. Time (msec)


rnga
1/13/0/04
Impact Testing
G05I7 001.2
2005 SUBARU OUTBACK
FMVSS 201U - UPPER INTERIOR
TEST #4 C55501 RIGHT OP2
FW IMPACT ANGLE= 90/0
TM4240
PRE-TEST





SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G05I7-001.2 VEHICLE YR/MAKE/MODEL:2005/Subaru/Outback

GENERAL TEST PARAMETERS:

Target (Vehicle Side): OP2 Right

MGA Test Reference No.:FM4713

Approach Horizontal Angles:90°

Approach Vertical Angles:0°

Additional Description:

Test Number:#4

Temperature:22C

Humidity:31%

Time of Test:3:36 PM

FMH Serial No:038

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
609	587	7.1	23.9	22	3 R

INSTRUMENTAION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J36197	-110	1.44	1.44
Y	6	J36193	101.9	1.54	1.54
Z	7	J36353	96.7	1.17	1.46

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage

Recorded By: _____ Approved By*: _____ Date: 11/30/04

*Only necessary for NHTSA (Government) Compliance testing.

FMH
G05I7-001.2

Customer: Subaru
Test # 4
FM4713
Additional Desc: N/A

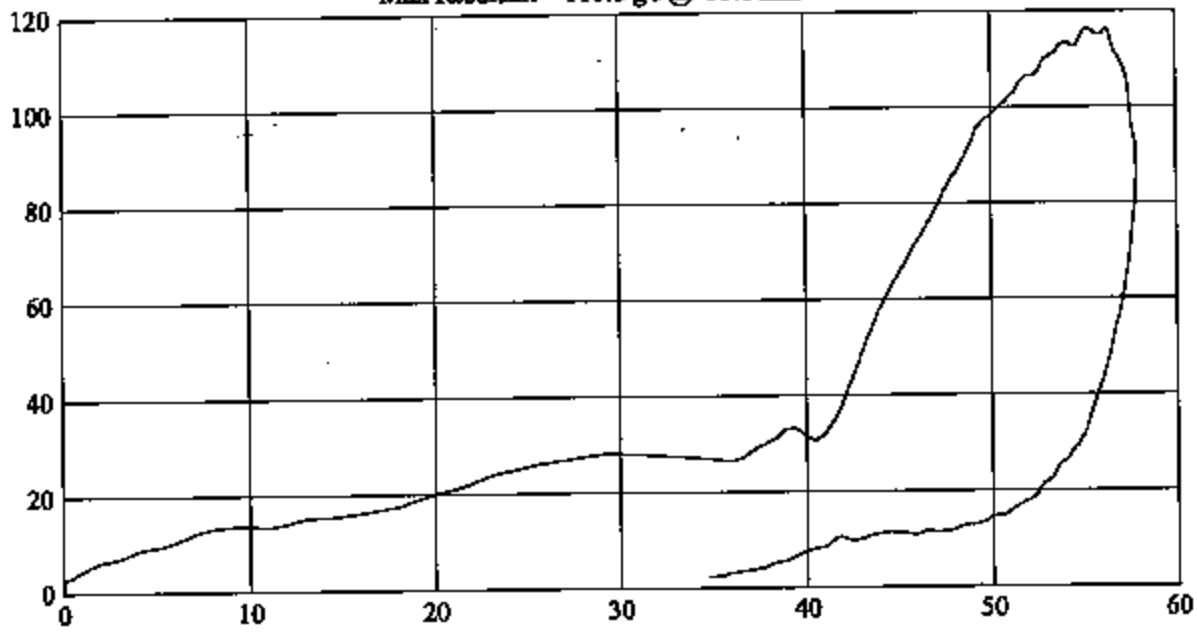
Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005
Target: OP2
Vehicle Side: Right
Horz/Vert Angle: 90/0

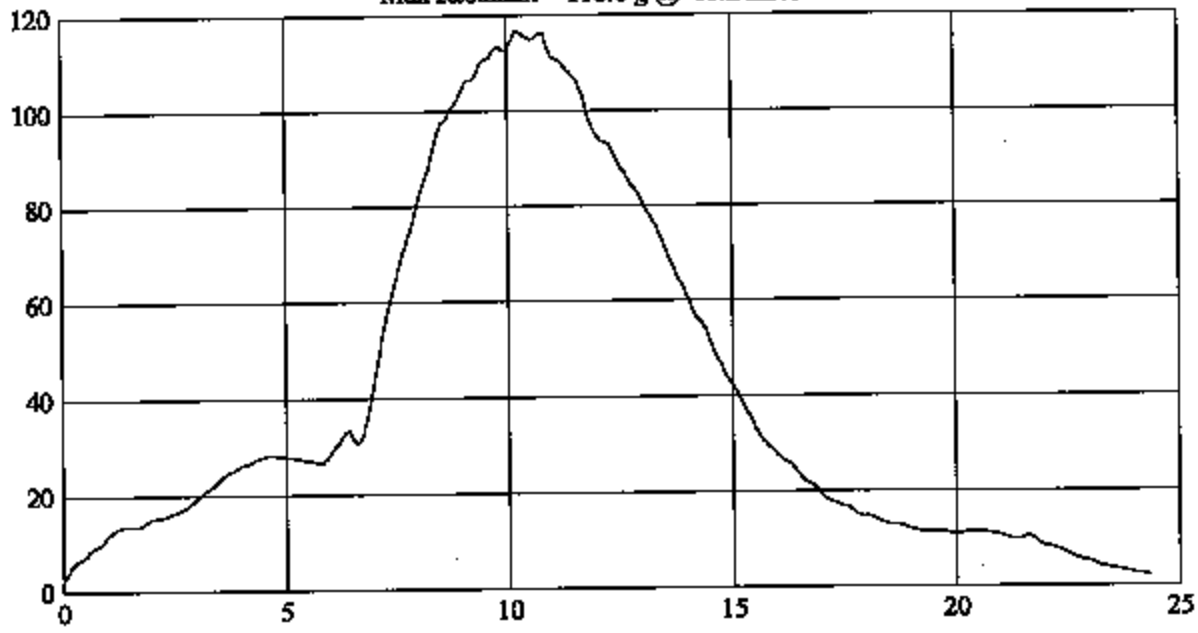
HIC(d) = 609, HIC = 587, Delta T = 7.1 msec

Max Resultant = 116.6 g's @ 55.1 mm



Resultant (g's) vs. Displacement (mm)

Max Resultant = 116.6 g @ 10.2 msec



Resultant Accel (g's) vs. Time (msec)

FMH
G05I7-001.2

Customer: Subaru
Test # 4
FM4713
Additional Desc: N/A

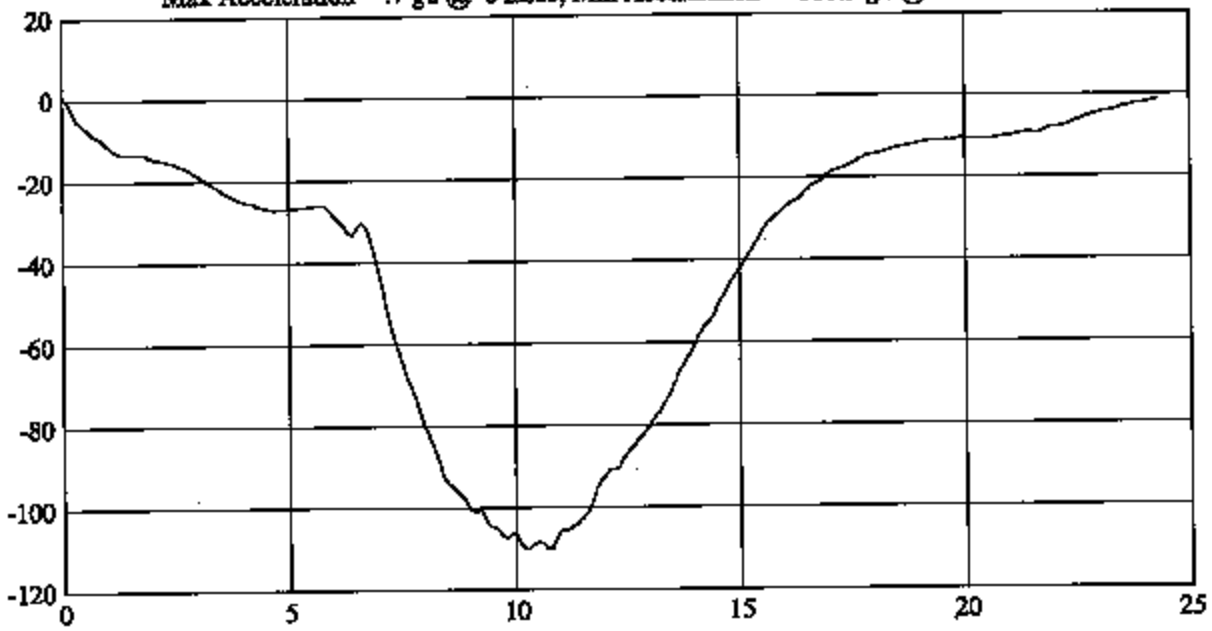
Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005
Target: OP2
Vehicle Side: Right
Horz/Vert Angle: 90/0

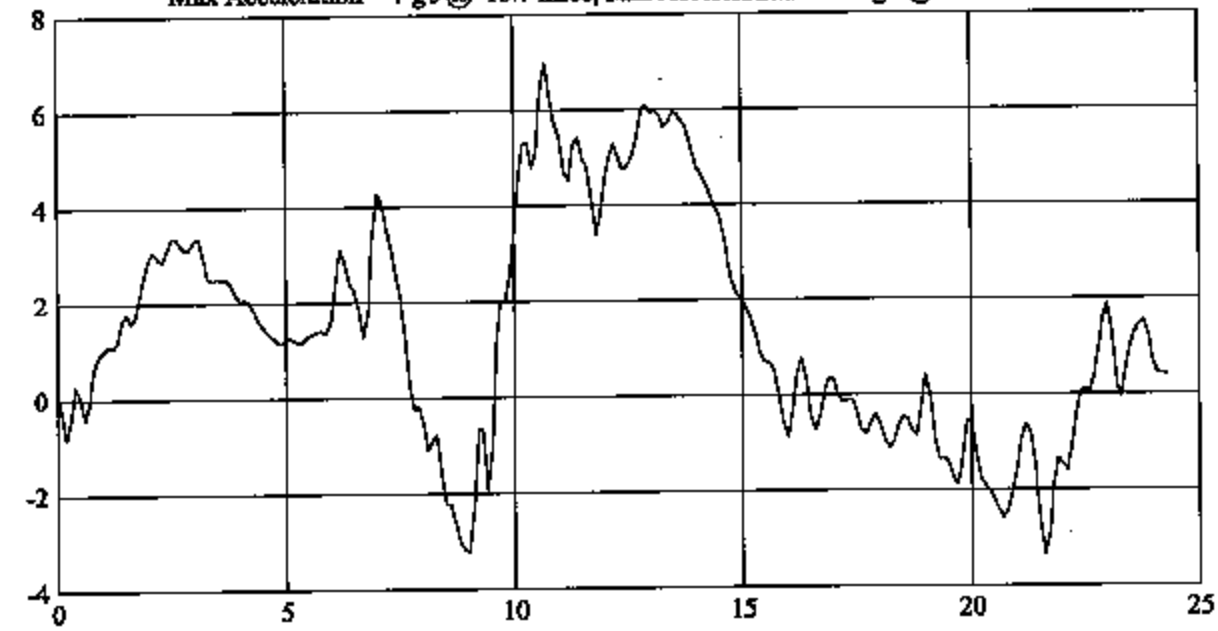
HIC(d) = 609, HIC = 587, Delta T = 7.1 msec

Max Acceleration = .7 g's @ 0 msec, Min Acceleration = -110.3 g's @ 10.2 msec



Accel X (g's) vs. Time (msec)

Max Acceleration = 7 g's @ 10.7 msec, Min Acceleration = -3.4 g's @ 21.6 msec



Accel Y (g's) vs. Time (msec)

FMH
G05I7-001.2

Customer: Subaru
Test # 4
FM4713
Additional Desc: N/A

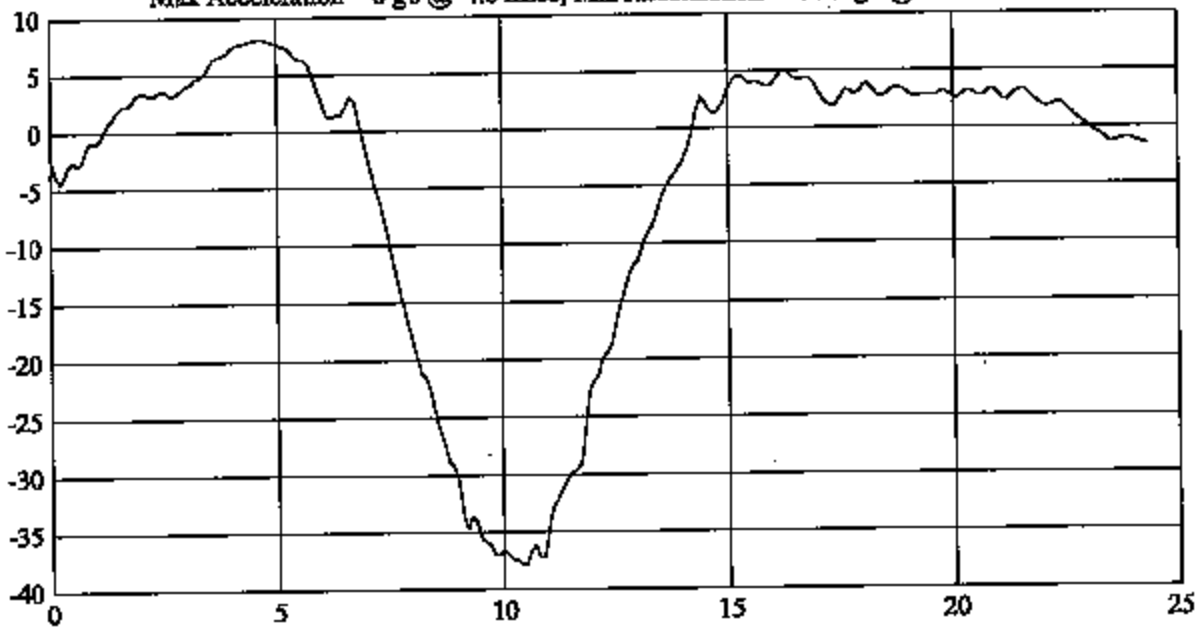
Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005
Target: OP2
Vehicle Side: Right
Horz/Vert Angle: 90/0

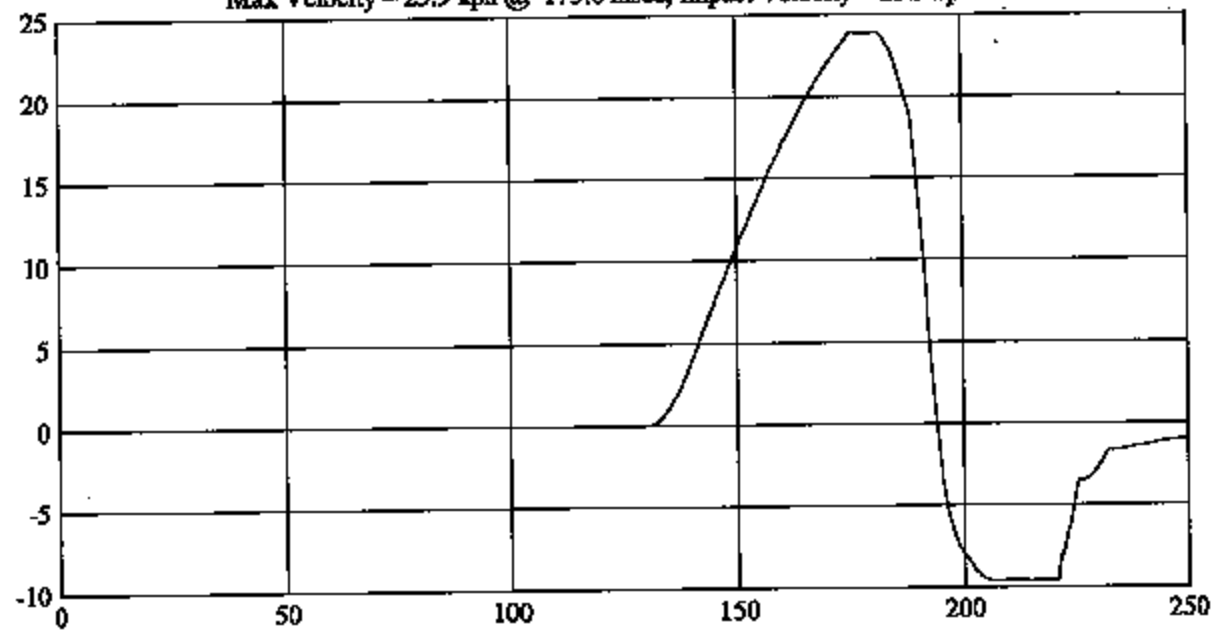
HIC(d) = 609, HIC = 587, Delta T = 7.1 msec

Max Acceleration = 8 g's @ 4.6 msec, Min Acceleration = -37.9 g's @ 10.5 msec



Accel Z (g's) vs. Time (msec)

Max Velocity = 23.9 kph @ 175.6 msec, Impact Velocity = 23.9 kph



Velocity (kph) vs. Time (msec)

FMH
G05I7-001.2

Customer: Subaru
Test # 4
FM4713
Additional Desc: N/A

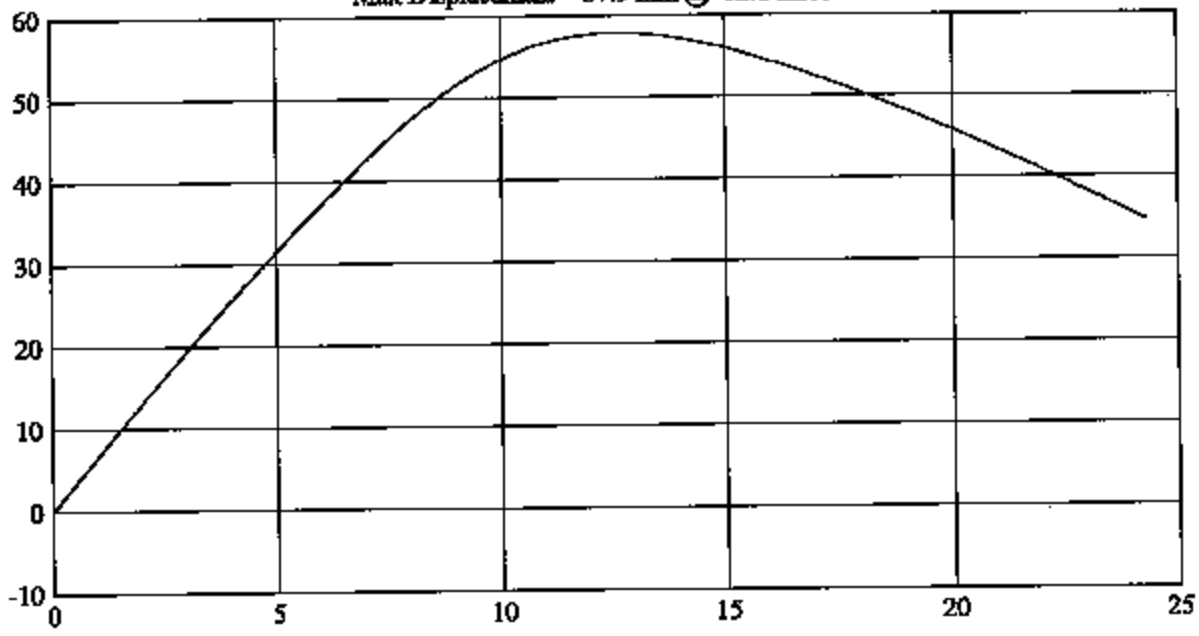
Vehicle Program : Outback

Test Date: 11/30/04

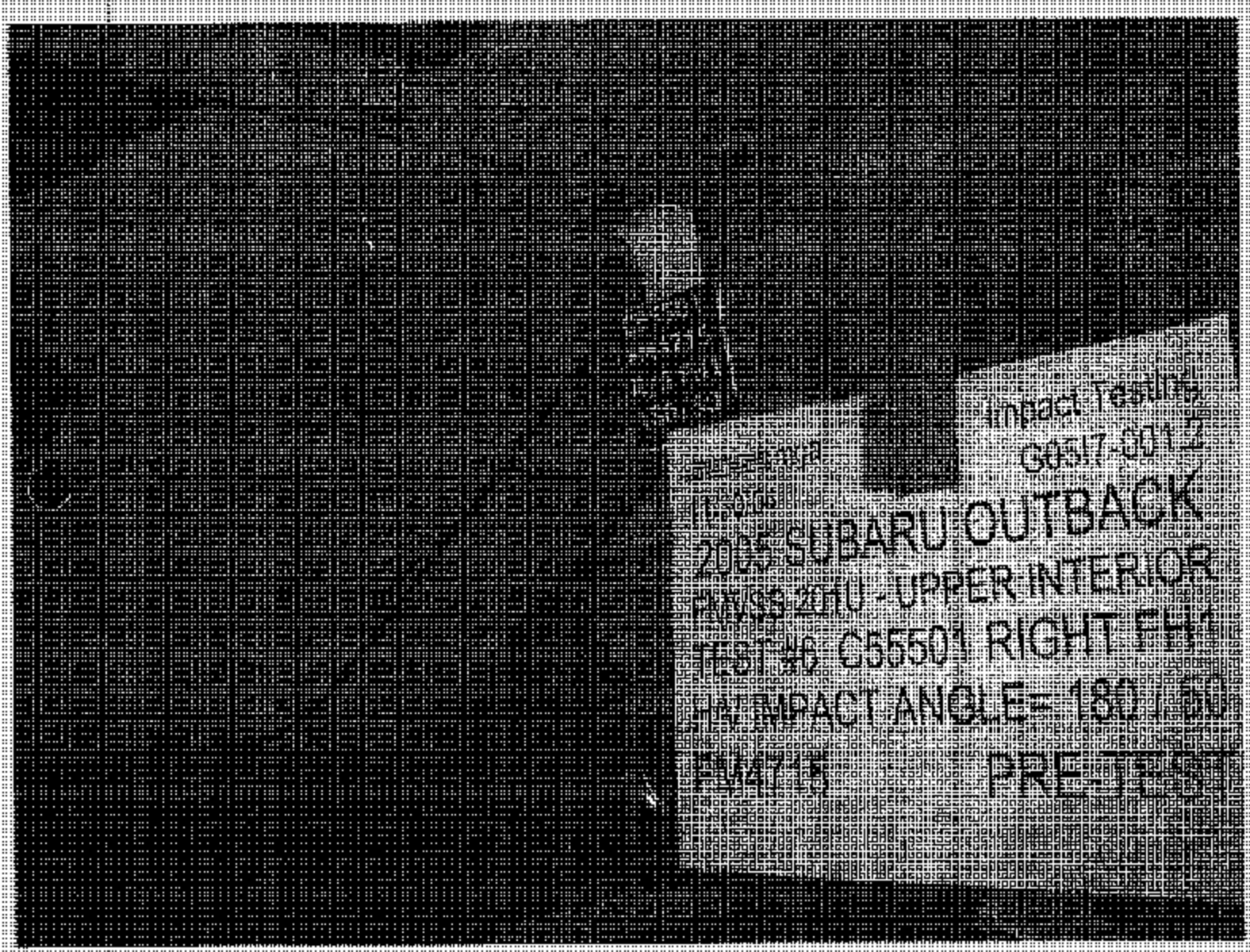
Model Year: 2005
Target: OP2
Vehicle Side: Right
Horz/Vert Angle: 90/0

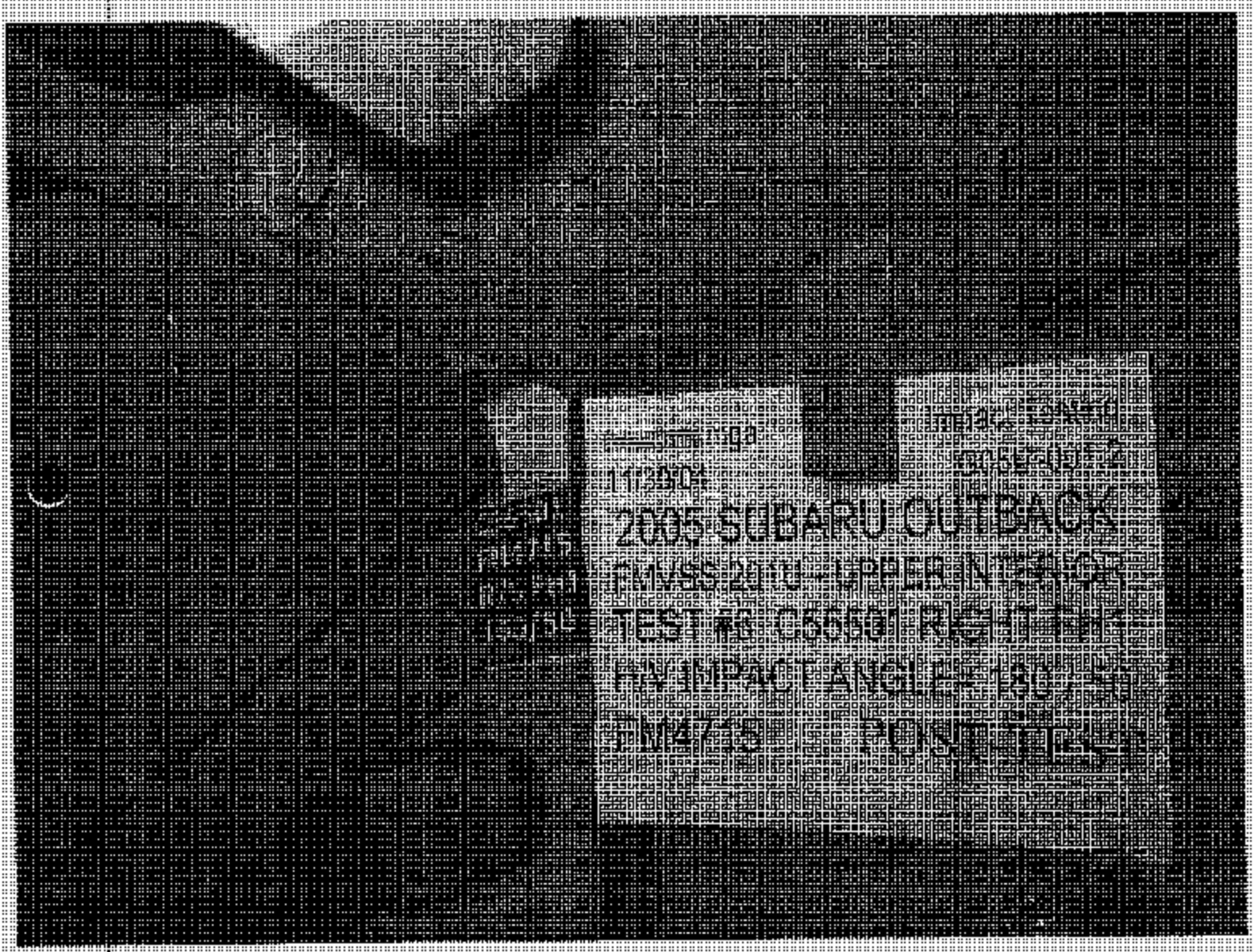
HIC(d) = 609, HIC = 587, Delta T = 7.1 msec

Max Displacement = 57.9 mm @ 12.6 msec



Displacement (mm) vs. Time (msec)


Impact Results
GOAL 90 12
2015 SUBARU OUTBACK
RW-SS-2nU - UPPER INTERIOR
TEST #6 C55501 RIGHT FH1
IMPACT ANGLE= 180 +0V
EV4745
PRE-TEST


2005 SUBARU OUTBACK
TEST #: C5058
FMVSS 208 - UPPER N

MICHIGAN OPERATIONS
DATE: 2/8/01
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP2072103
REVISION NO.: 2
PAGE 1 OF 1

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G05I7-001.2 VEHICLE YR/MAKE/MODEL:2005/Subaru/Outback

GENERAL TEST PARAMETERS:

Target (Vehicle Side): FH1 Right

MGA Test Reference No.:FM4715

Approach Horizontal Angles:180°

Approach Vertical Angles:50°

Additional Description:

Test Number:#8

Temperature:22C

Humidity:31%

Time of Test:5:20 PM

FMH Serial No:036

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
770	800	5.4	23.5	11	6 R

INSTRUMENTAION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35923	-99.8	1.44	1.44
Y	6	J35916	99.7	1.54	1.54
Z	7	J35918	98.1	1.18	1.17

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage

Recorded By: _____ Approved By*: _____ Date: 11/30/04

*Only necessary for NHTSA (Government) Compliance testing

FMH
G05I7-001.2

Customer: Subaru
Test # 6
FM4715
Additional Desc: N/A

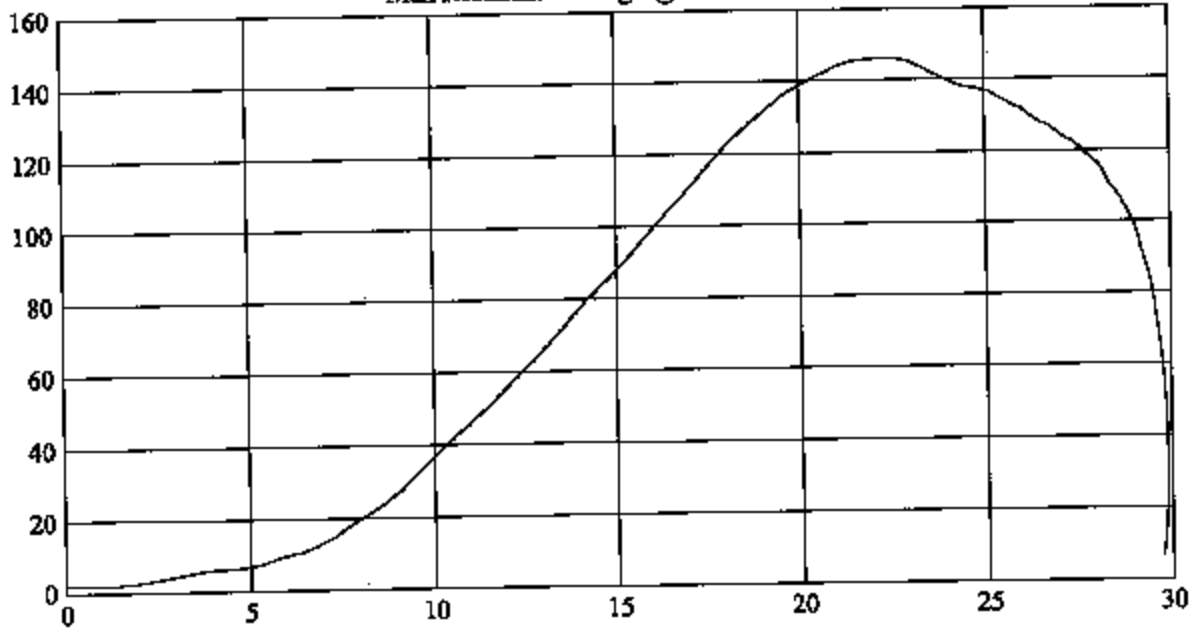
Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005
Target: FH1
Vehicle Side: Right
Horz/Vert Angle: 180/50

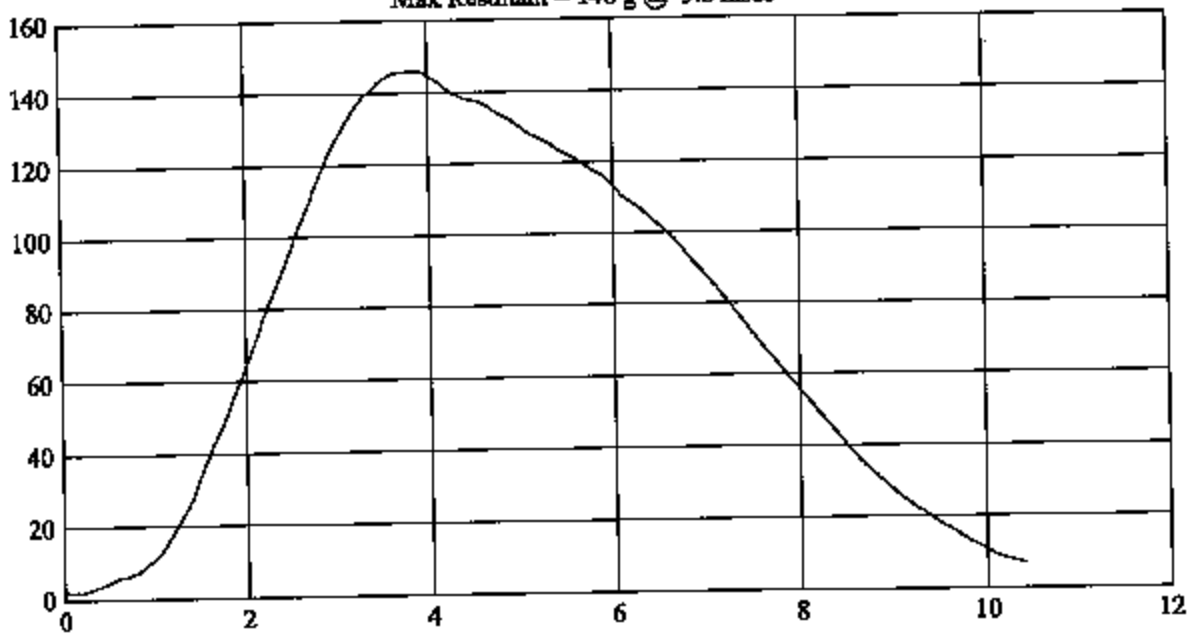
HIC(d) = 770, HIC = 800, Delta T = 5.4 msec

Max Resultant = 146 g's @ 22.2 mm



Resultant (g's) vs. Displacement (mm)

Max Resultant = 146 g @ 3.8 msec



Resultant Accel (g's) vs. Time (msec)

FMH
G05I7-001.2

Customer: Subaru
Test # 6
FM4715
Additional Desc: N/A

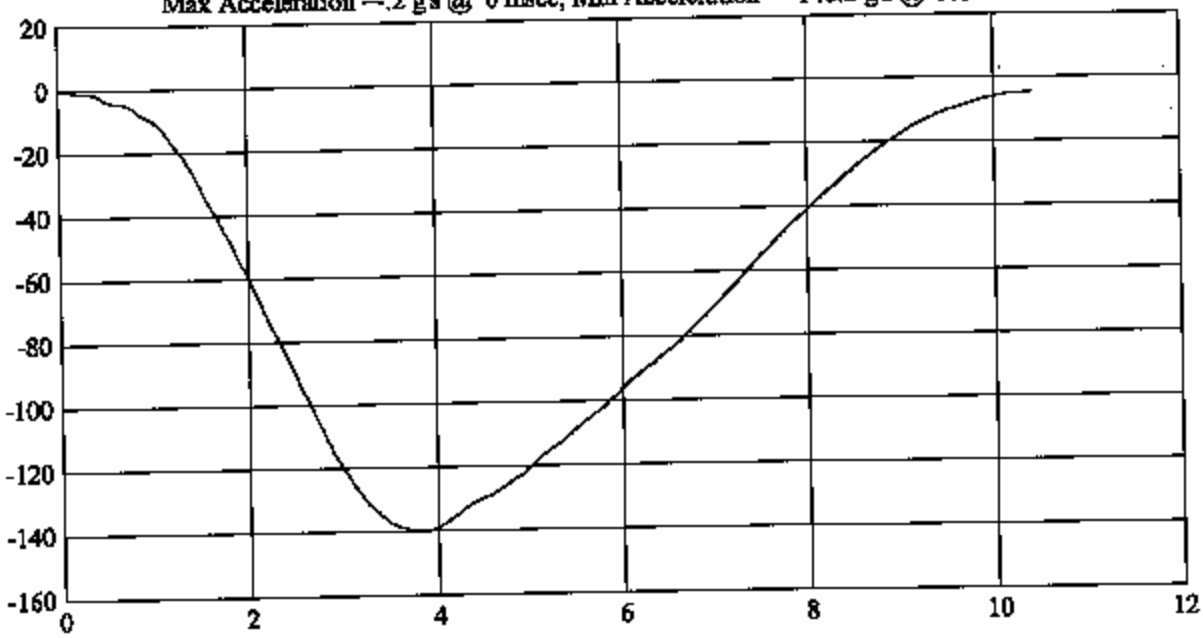
Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005
Target: FH1
Vehicle Side: Right
Horz/Vert Angle: 180/50

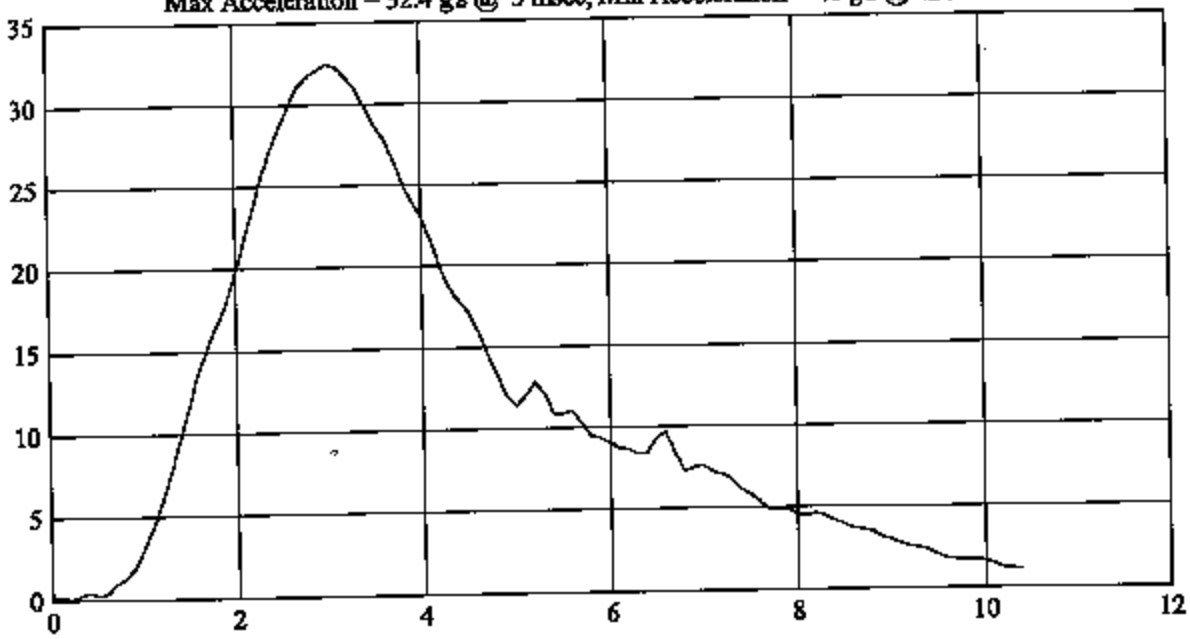
HIC(d) = 770, HIC = 800, Delta T = 5.4 msec

Max Acceleration = .2 g's @ 0 msec, Min Acceleration = -140.2 g's @ 3.8 msec



Accel X (g's) vs. Time (msec)

Max Acceleration = 32.4 g's @ 3 msec, Min Acceleration = .1 g's @ .2 msec



Accel Y (g's) vs. Time (msec)

FMH
G05I7-001.2

Customer: Subaru
Test # 6
FM4715
Additional Desc: N/A

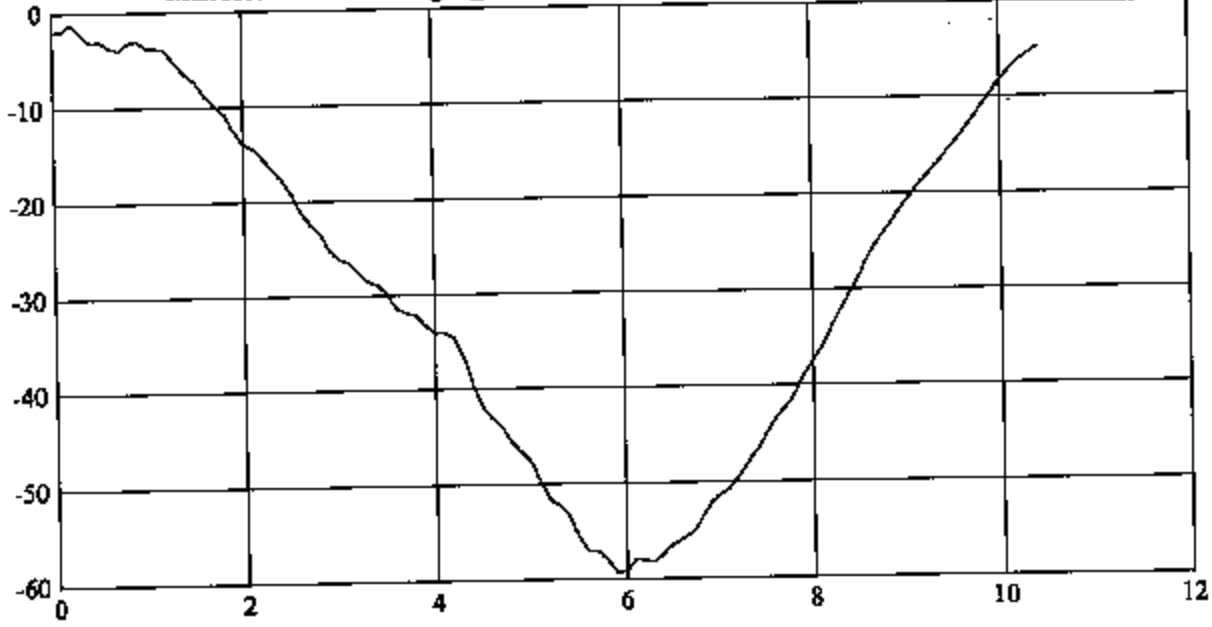
Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005
Target: FH1
Vehicle Side: Right
Horz/Vert Angle: 180/50

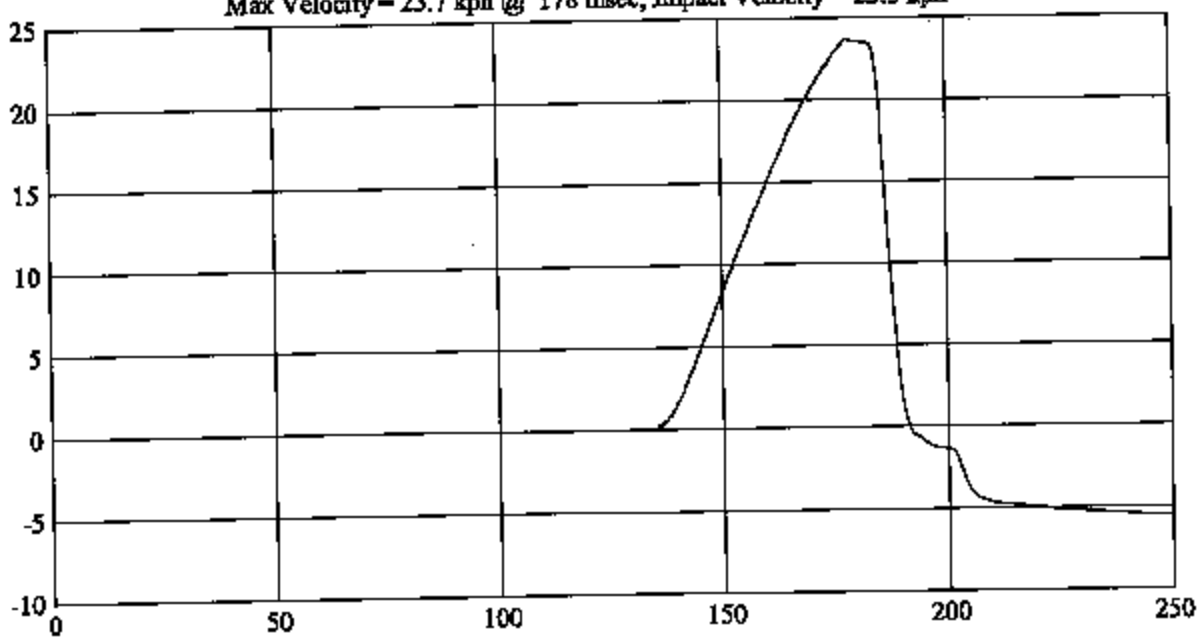
HIC(d) = 770, HIC = 800, Delta T = 5.4 msec

Max Acceleration =-1.2 g's @ .2 msec, Min Acceleration = -59.5 g's @ 5.9 msec



Accel Z (g's) vs. Time (msec)

Max Velocity = 23.7 kph @ 178 msec, Impact Velocity = 23.5 kph



Velocity (kph) vs. Time (msec)

FMH
G05I7-001.2

Customer: Subaru
Test # 6
FM4715
Additional Desc: N/A

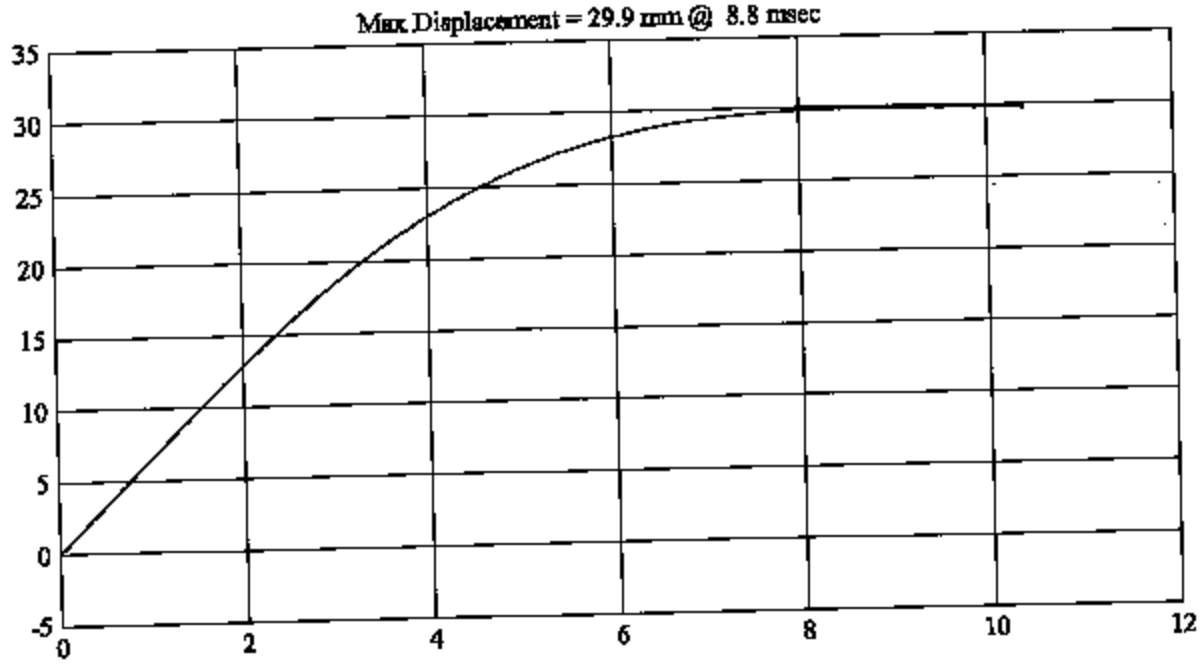
Vehicle Program : Outback

Test Date: 11/30/04

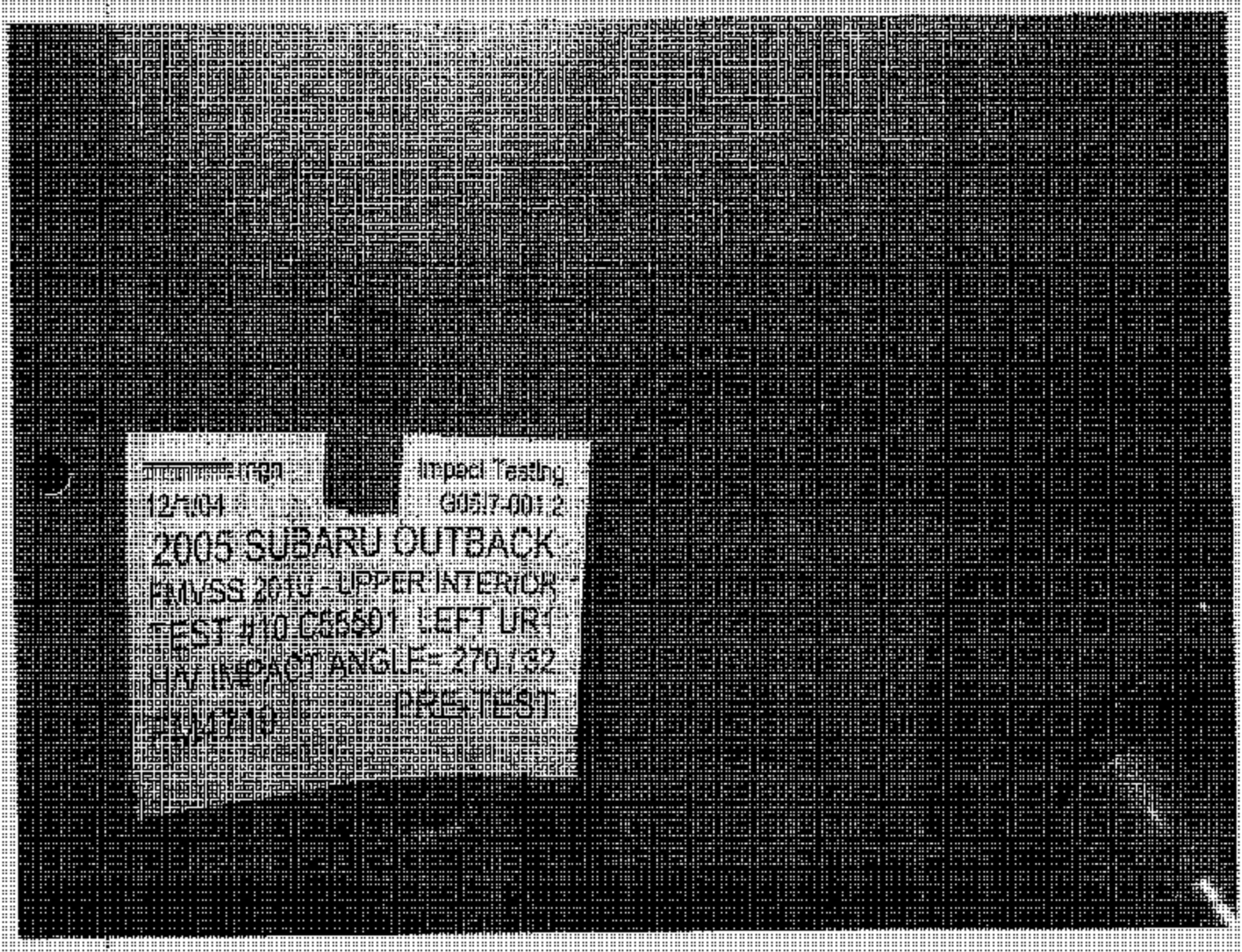
Model Year: 2005
Target: FH1
Vehicle Side: Right
Horz/Vert Angle: 180/50

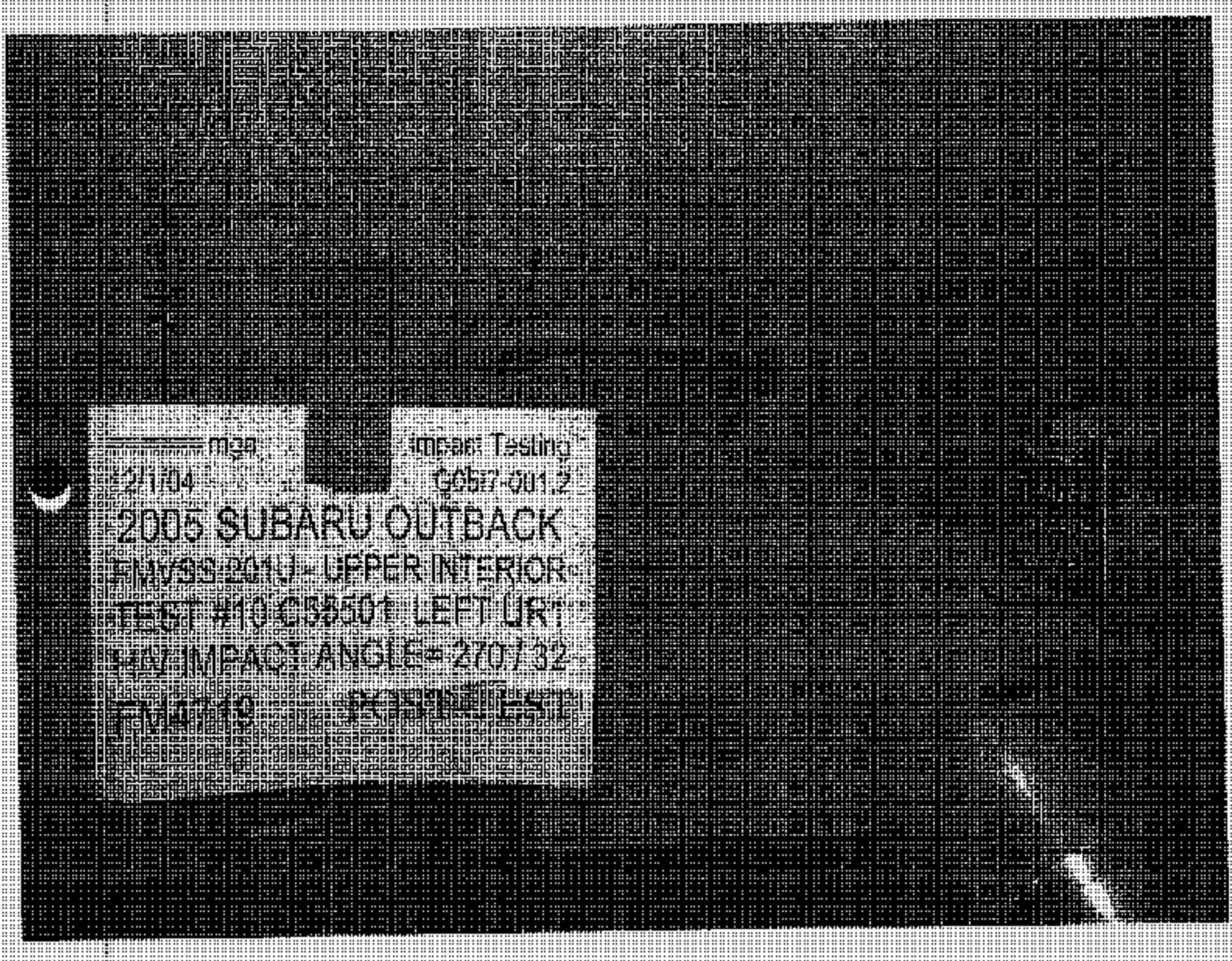
HIC(d) = 770, HIC = 800, Delta T = 5.4 msec

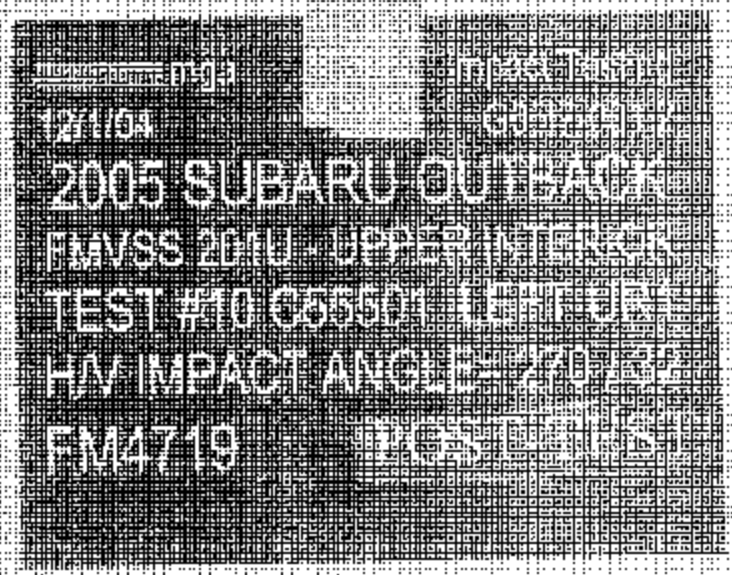
Max Displacement = 29.9 mm @ 8.8 msec



Displacement (mm) vs. Time (msec)


Impact Testing
605.7-001.2
2005 SUBARU OUTBACK
FMVSS 201U - UPPER INTERIOR
TEST # 0 C8501 LEFT UR1
HAV IMPACT ANGLE = 270.32
PRE-TEST


MGA
Inertial Testing
12/1/04
G057-011.2
2005 SUBARU OUTBACK
FMVSS 201U - UPPER INTERIOR
TEST #10 C5550-1 LEFT URT
HEV IMPACT ANGLE = 270 / 32
FW 40 / 19
REMARKS: ES-2


12/1/04
2005 SUBARU OUTBACK
FMVSS 201U UPPER INTERIOR
TEST #10 03552
HM IMPACT ANGLE 72°
FM4719

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G05I7-001.2 VEHICLE YR/MAKE/MODEL:2005/Subaru/Outback

GENERAL TEST PARAMETERS:

Target (Vehicle Side): UR1 Left

MGA Test Reference No.:FM4719

Approach Horizontal Angles:270°

Approach Vertical Angles:32°

Additional Description:

Test Number:#10

Temperature:21C

Humidity:31%

Time of Test:3:36 PM

FMH Serial No:038

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
542	498	8.9	23.9	60	17 R

INSTRUMENTAION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J36197	-110	1.44	1.44
Y	6	J36193	101.9	1.54	1.54
Z	7	J36353	96.7	1.17	1.16

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

Grab Handle was broken during impact.

Headliner deformation.

Recorded By: _____ Approved By*: _____ Date: 12/1/04

*Only necessary for NHTSA (Government) Compliance testing.

FMH
G05I7-001.2

Customer: Subaru
Test # 10
FM4719
Additional Desc: N/A

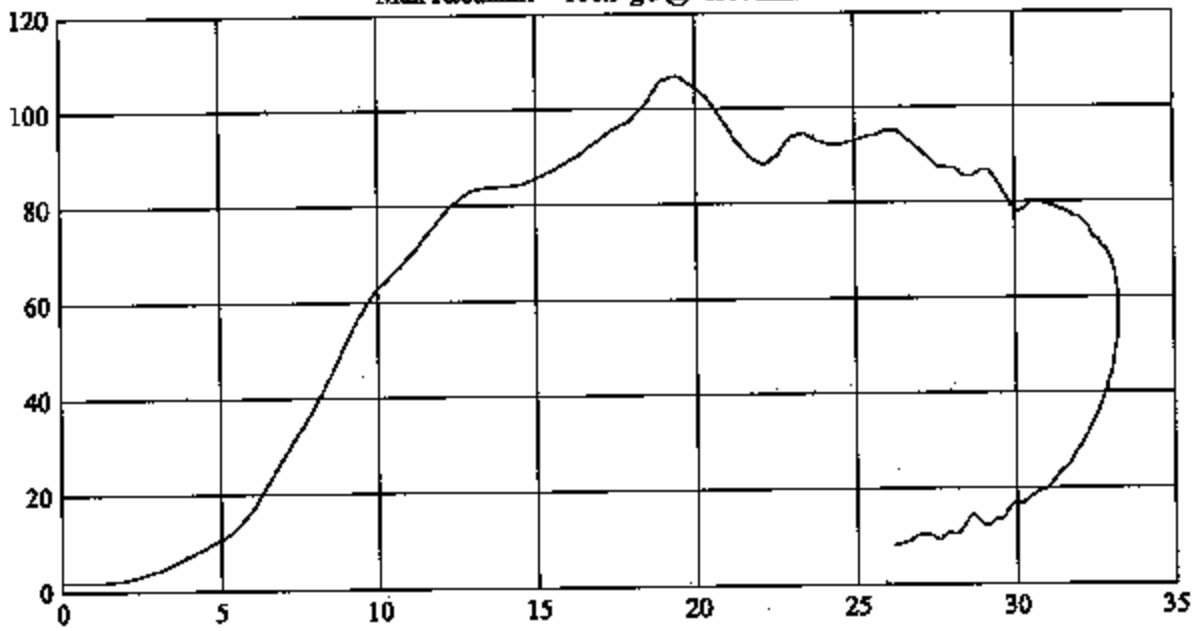
Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005
Target: UR1
Vehicle Side: Left
Horz/Vert Angle: 270/32

HIC(d) = 542, HIC = 498, Delta T = 8.9 msec

Max Resultant = 106.9 g's @ 19.4 mm



Resultant (g's) vs. Displacement (mm)

Max Resultant = 106.9 g @ 3.2 msec



Resultant Accel (g's) vs. Time (msec)

FMH
G05I7-001.2

Customer: Subaru
Test # 10
FM4719
Additional Desc: N/A

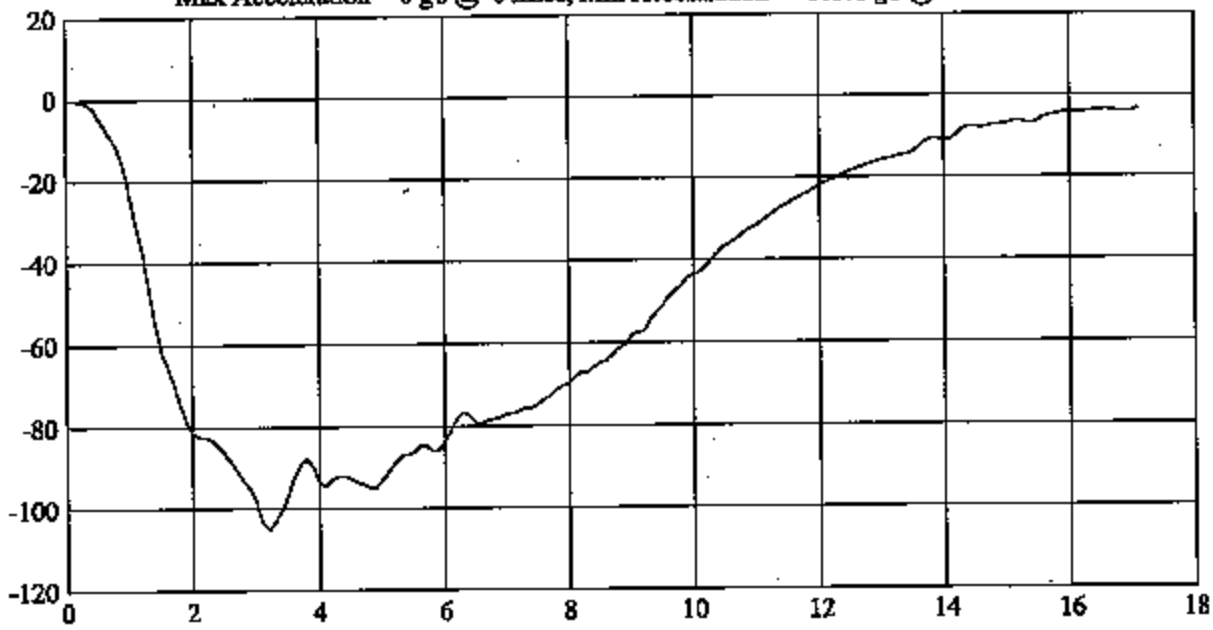
Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005
Target: UR1
Vehicle Side: Left
Horz/Vert Angle: 270/32

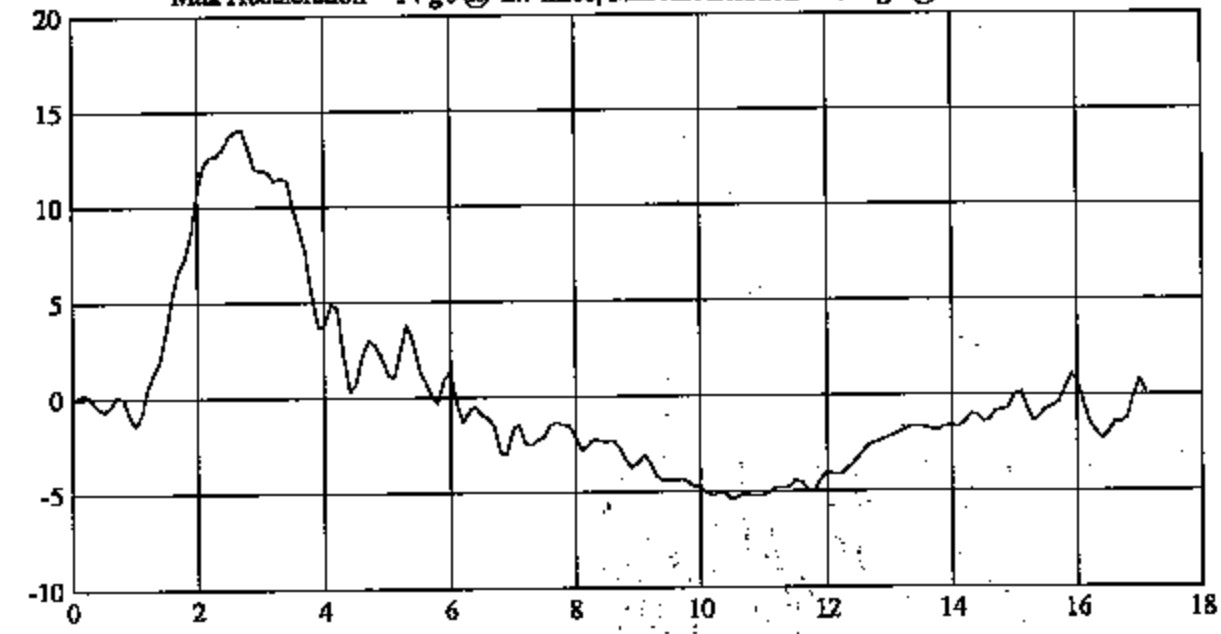
HIC(d) = 542, HIC = 498, Delta T = 8.9 msec

Max Acceleration = 0 g's @ 0 msec, Min Acceleration = -105.1 g's @ 3.2 msec



Accel X (g's) vs. Time (msec)

Max Acceleration = 14 g's @ 2.7 msec, Min Acceleration = -5.4 g's @ 10.5 msec



Accel Y (g's) vs. Time (msec)

FMH
G05I7-001.2

Customer: Subaru
Test # 10
FM4719
Additional Desc: N/A

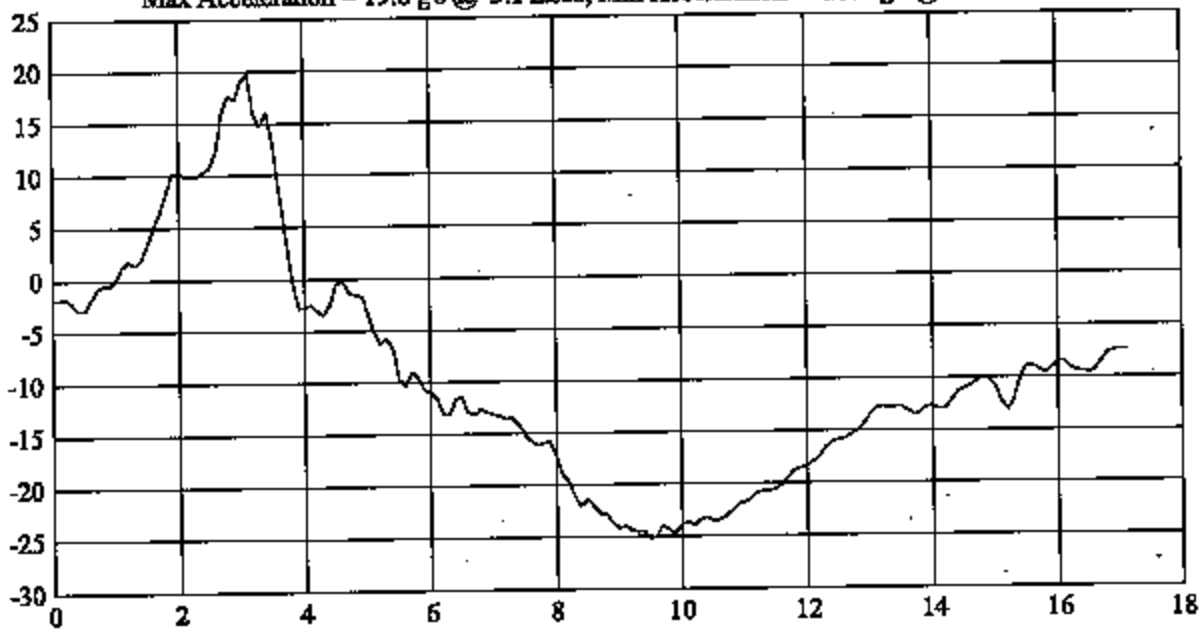
Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005
Target: UR1
Vehicle Side: Left
Horz/Vert Angle: 270/32

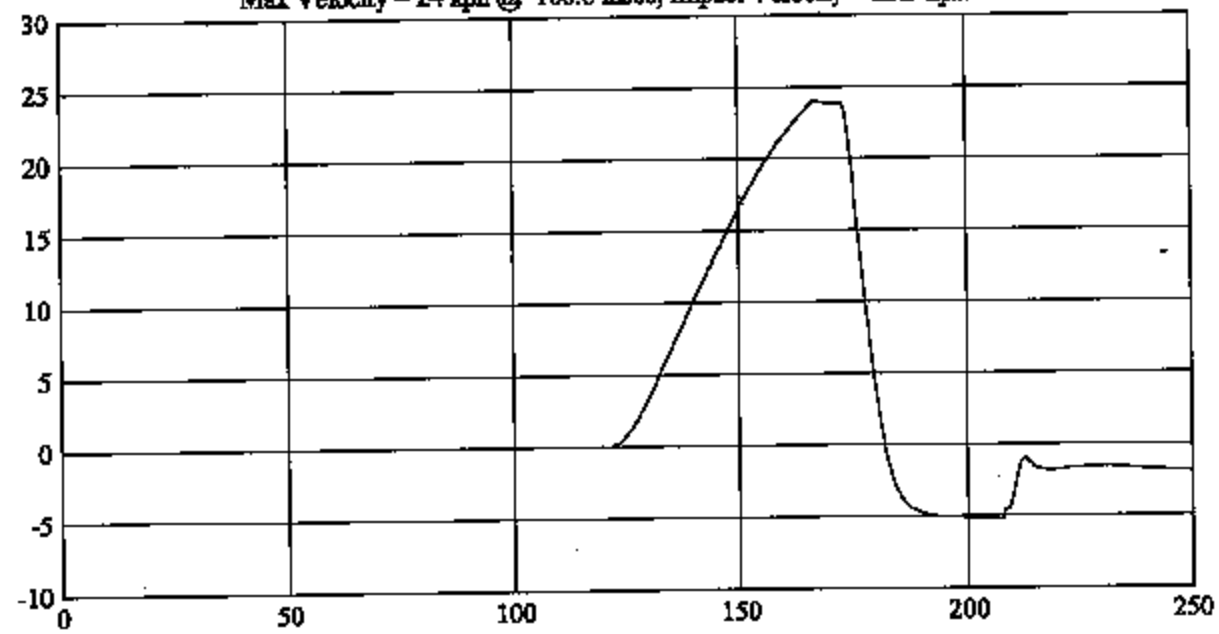
HIC(d) = 542, HIC = 498, Delta T = 8.9 msec

Max Acceleration = 19.6 g's @ 3.1 msec, Min Acceleration = -25.2 g's @ 9.5 msec



Accel Z (g's) vs. Time (msec)

Max Velocity = 24 kph @ 166.8 msec, Impact Velocity = 23.9 kph



Velocity (kph) vs. Time (msec)

FMH
G05I7-001.2

Customer: Subaru
Test # 10
FM4719
Additional Desc: N/A

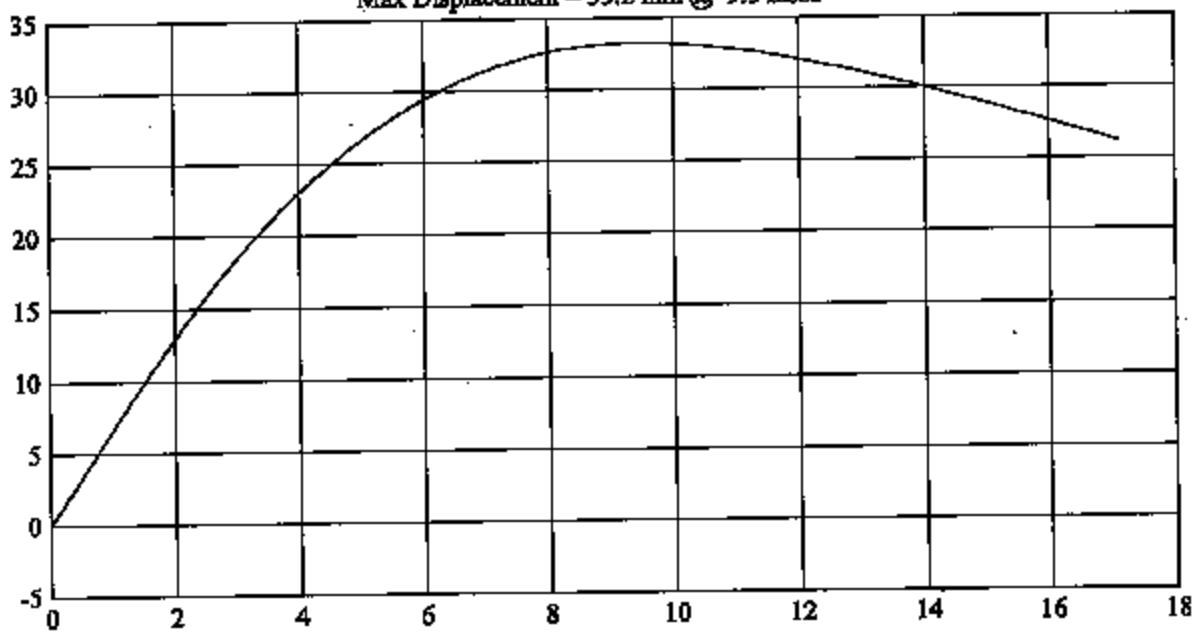
Vehicle Program : Outback

Test Date: 12/1/04

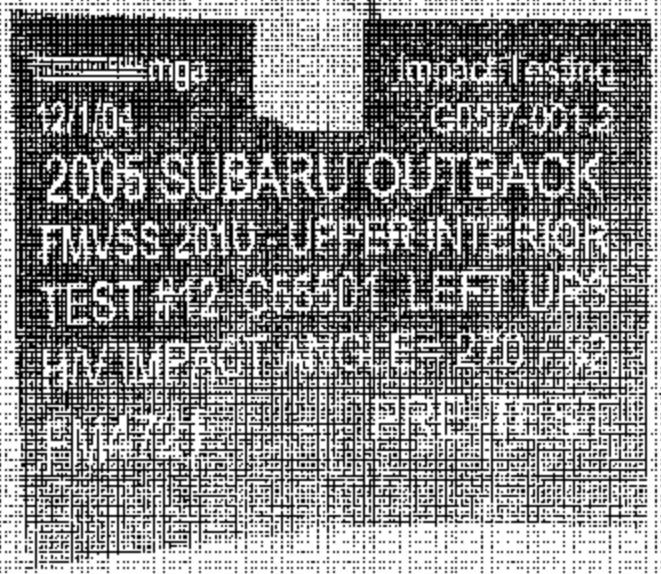
Model Year: 2005
Target: UR1
Vehicle Side: Left
Horz/Vert Angle: 270/32

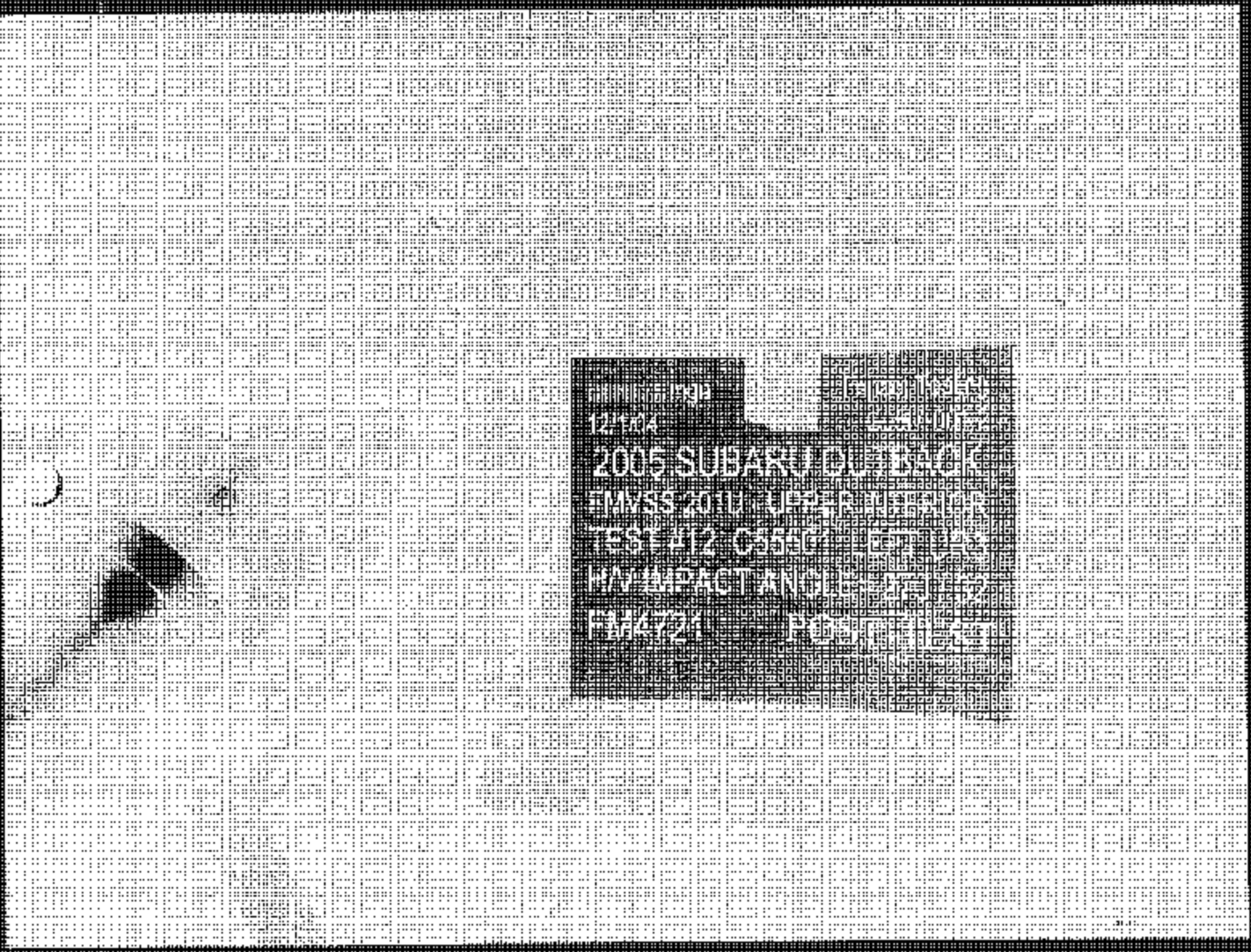
HIC(d) = 542, HIC = 498, Delta T = 8.9 msec

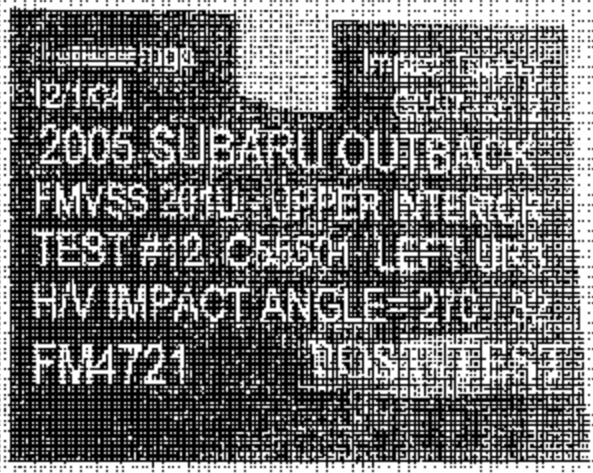
Max Displacement = 33.2 mm @ 9.5 msec



Displacement (mm) vs. Time (msec)


mga
impact laser
2005 SUBARU OUTBACK
FMVSS 208 - 35 PERCENTILE
TEST #
FMVSS 208 - 35 PERCENTILE


12:04
2005 SUBARU
MySS
TEST
HAMPSHIRE
#4424


2005 SUBARU OUTBACK
FMVSS 201U UPPER INTERIOR
TEST #12 C5.6H LEFT UPR
H/V IMPACT ANGLE= 270 / 0
FM4721

MICHIGAN OPERATIONS
DATE: 2/9/01
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3
REVISION NO.: 2
PAGE 1 OF 1

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G05I7-001.2 VEHICLE YR/MAKE/MODEL:2005/Subaru/Outback

GENERAL TEST PARAMETERS:

Target (Vehicle Side): UR3Left

MGA Test Reference No.:FM4721

Approach Horizontal Angles:270°

Approach Vertical Angles:32°

Additional Description:

Test Number:#12

Temperature:22C

Humidity:31%

Time of Test:5:10 PM

FMH Serial No:037

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
847	902	4.9	23.7	15	5 L

INSTRUMENTAION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35800	-98.4	1.44	1.43
Y	6	J35841	92.6	1.54	1.54
Z	7	J35791	88.8	1.17	1.14

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

Headliner deformation.

Recorded By: _____ Approved By*: _____ Date: 12/1/04

*Only necessary for NHTSA (Government) Compliance testing.

FMH
G05I7-001.2

Customer: Subaru
Test # 12
FM4721
Additional Desc: N/A

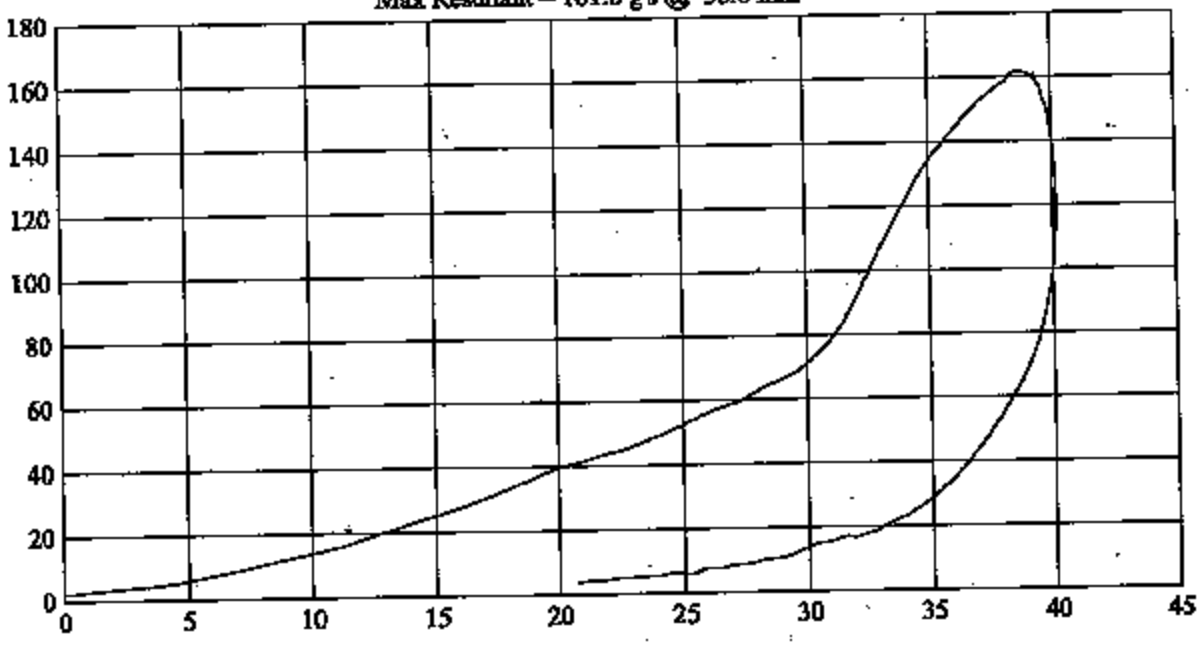
Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005
Target: UR3
Vehicle Side: Left
Horz/Vert Angle: 270/32

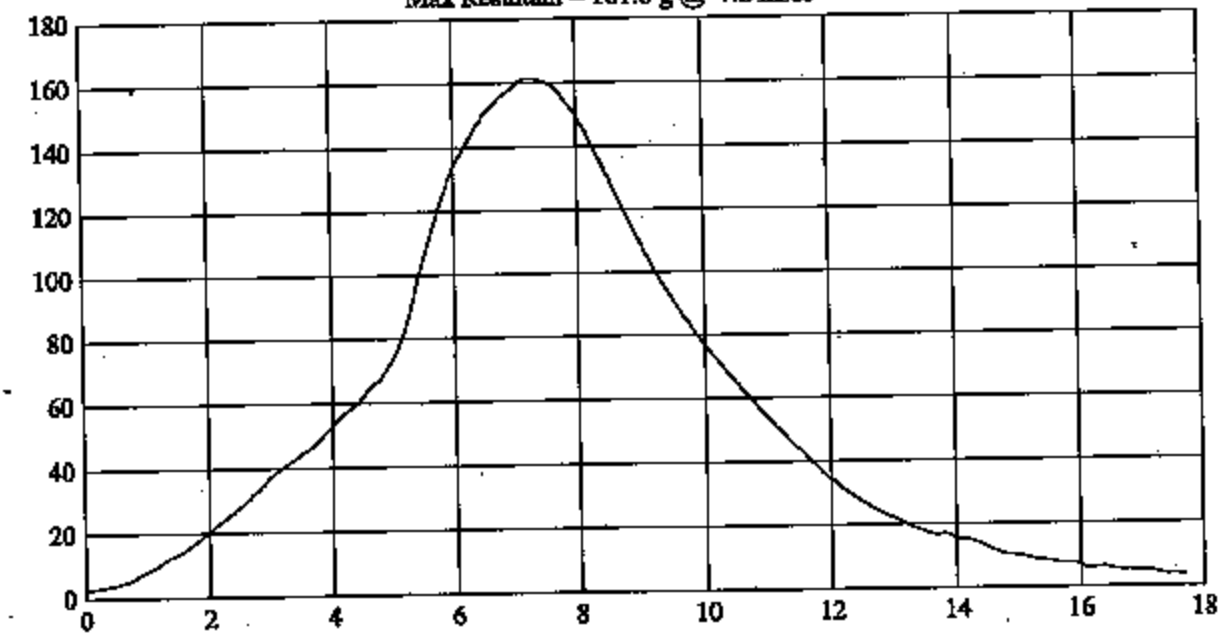
HIC(d) = 847, HIC = 902, Delta T = 4.9 msec

Max Resultant = 161.6 g's @ 38.6 mm



Resultant (g's) vs. Displacement (mm)

Max Resultant = 161.6 g @ 7.2 msec



Resultant Accel (g's) vs. Time (msec)

FMH
G05I7-001.2

Customer: Subaru
Test # 12
FM4721
Additional Desc: N/A

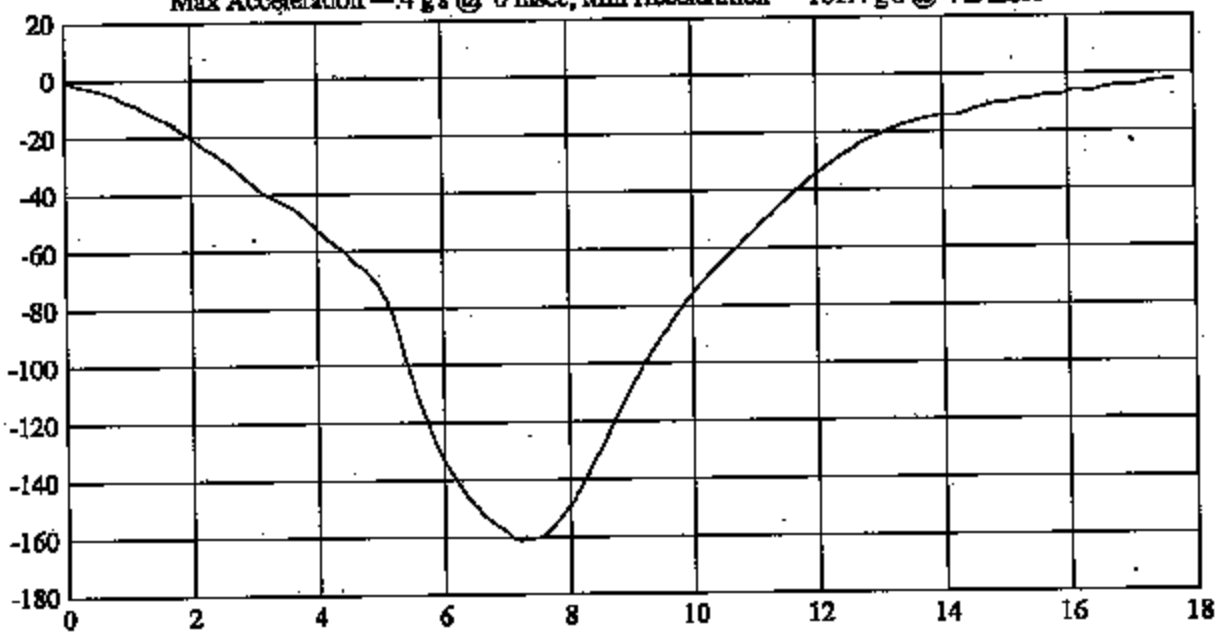
Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005
Target: UR3
Vehicle Side: Left
Horz/Vert Angle: 270/32

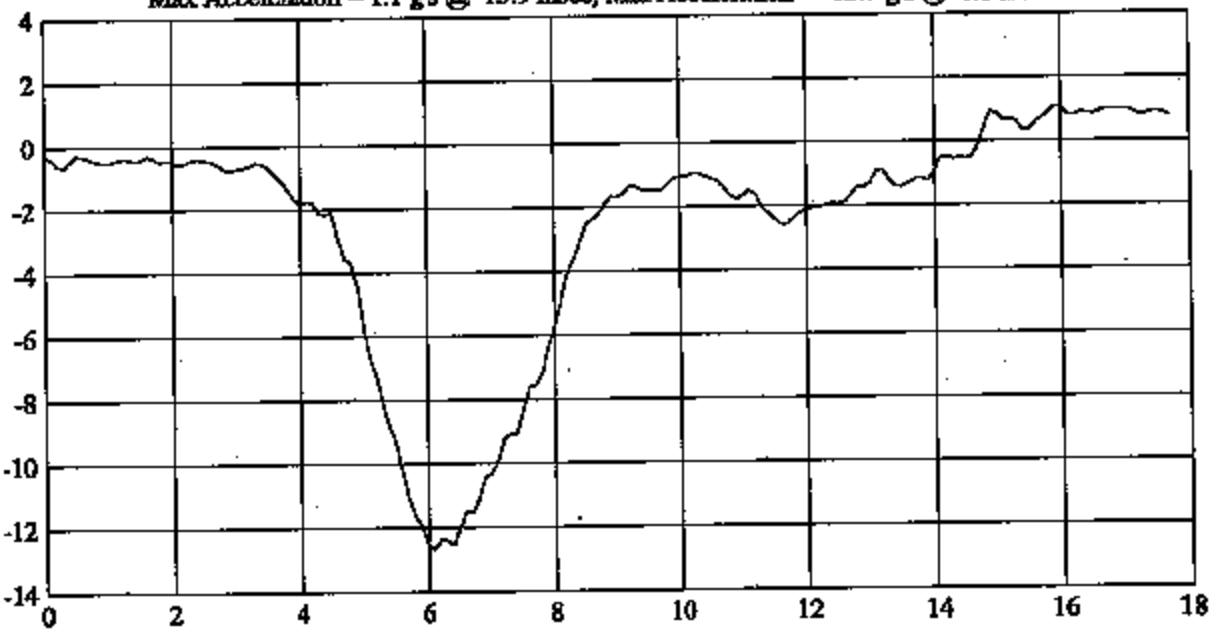
HIC(d) = 847, HIC = 902, Delta T = 4.9 msec

Max Acceleration = .4 g's @ 0 msec, Min Acceleration = -161.4 g's @ 7.2 msec



Accel X (g's) vs. Time (msec)

Max Acceleration = 1.1 g's @ 15.9 msec, Min Acceleration = -12.7 g's @ 6.1 msec



Accel Y (g's) vs. Time (msec)

FMH
G0517-001.2

Customer: Subaru
Test # 12
FM4721
Additional Desc: N/A

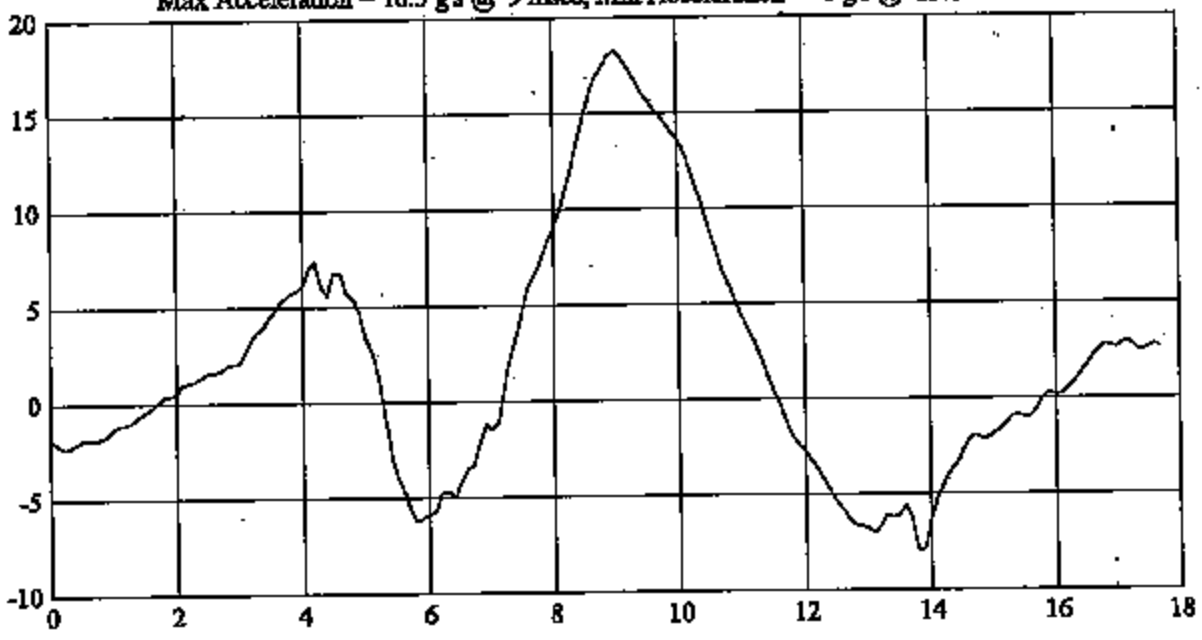
Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005
Target: UR3
Vehicle Side: Left
Horz/Vert Angle: 270/32

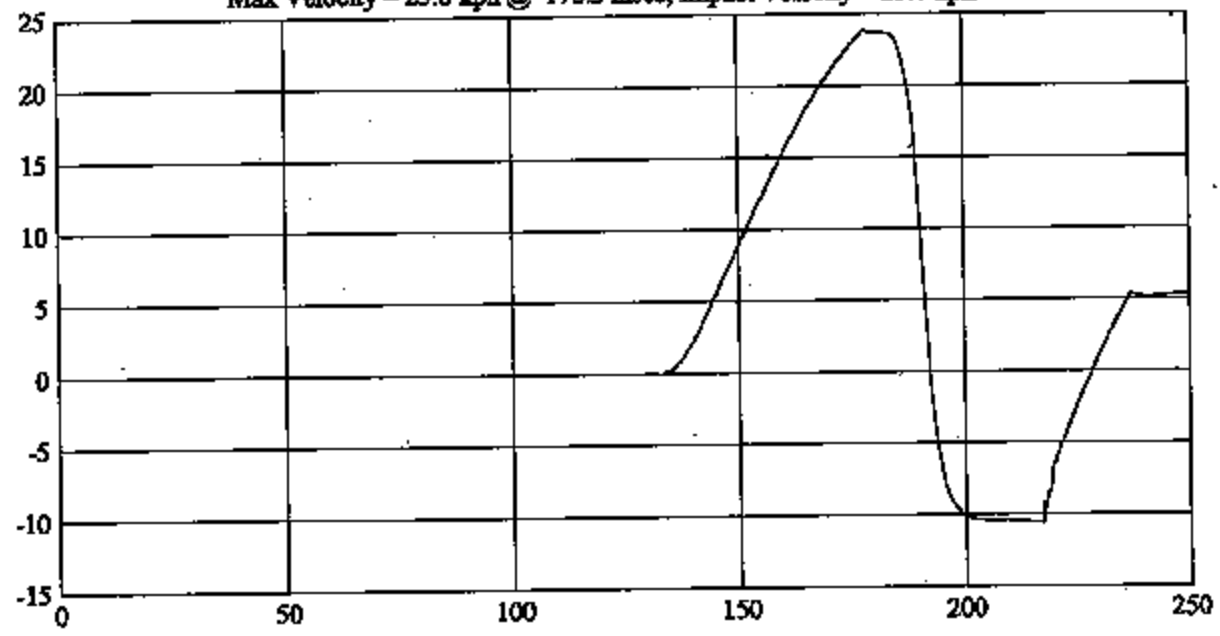
HIC(d) = 847, HIC = 902, Delta T = 4.9 msec

Max Acceleration = 18.3 g's @ 9 msec, Min Acceleration = -8 g's @ 13.8 msec



Accel Z (g's) vs. Time (msec)

Max Velocity = 23.8 kph @ 178.3 msec, Impact Velocity = 23.7 kph



Velocity (kph) vs. Time (msec)

FMH
G05I7-001.2

Customer: Subaru
Test # 12
FM4721
Additional Desc: N/A

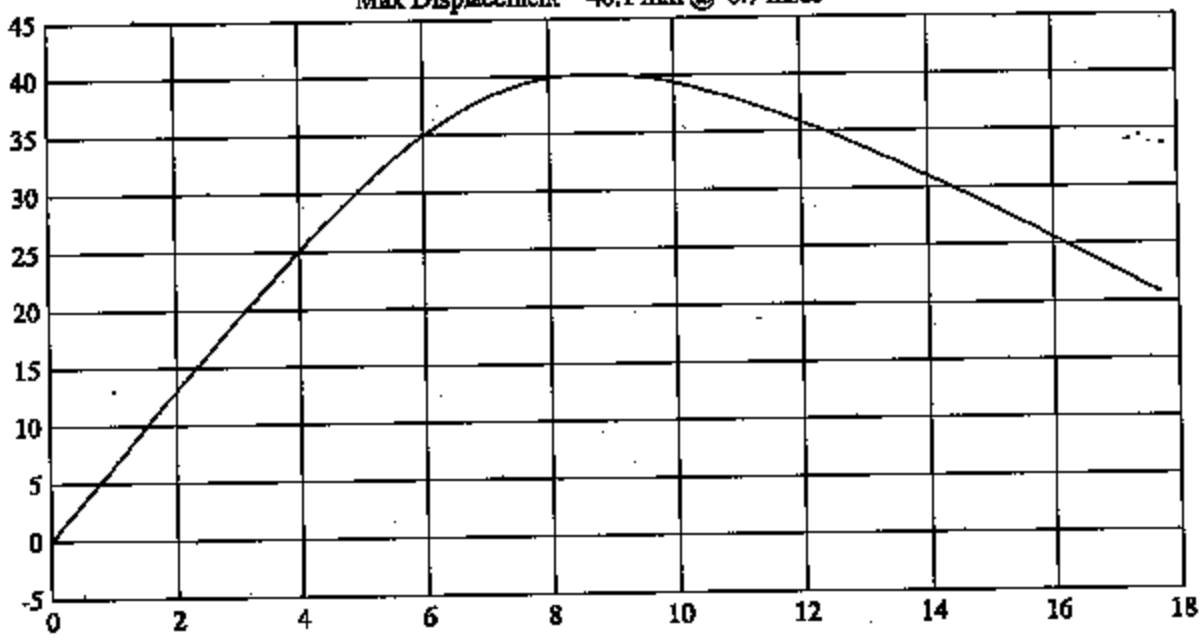
Vehicle Program : Outback

Test Date: 12/1/04

Model Year: 2005
Target: UR3
Vehicle Side: Left
Horz/Vert Angle: 270/32

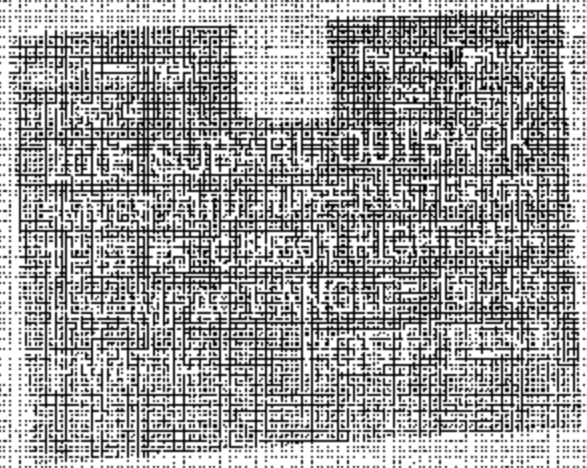
HIC(d) = 847, HIC = 902, Delta T = 4.9 msec

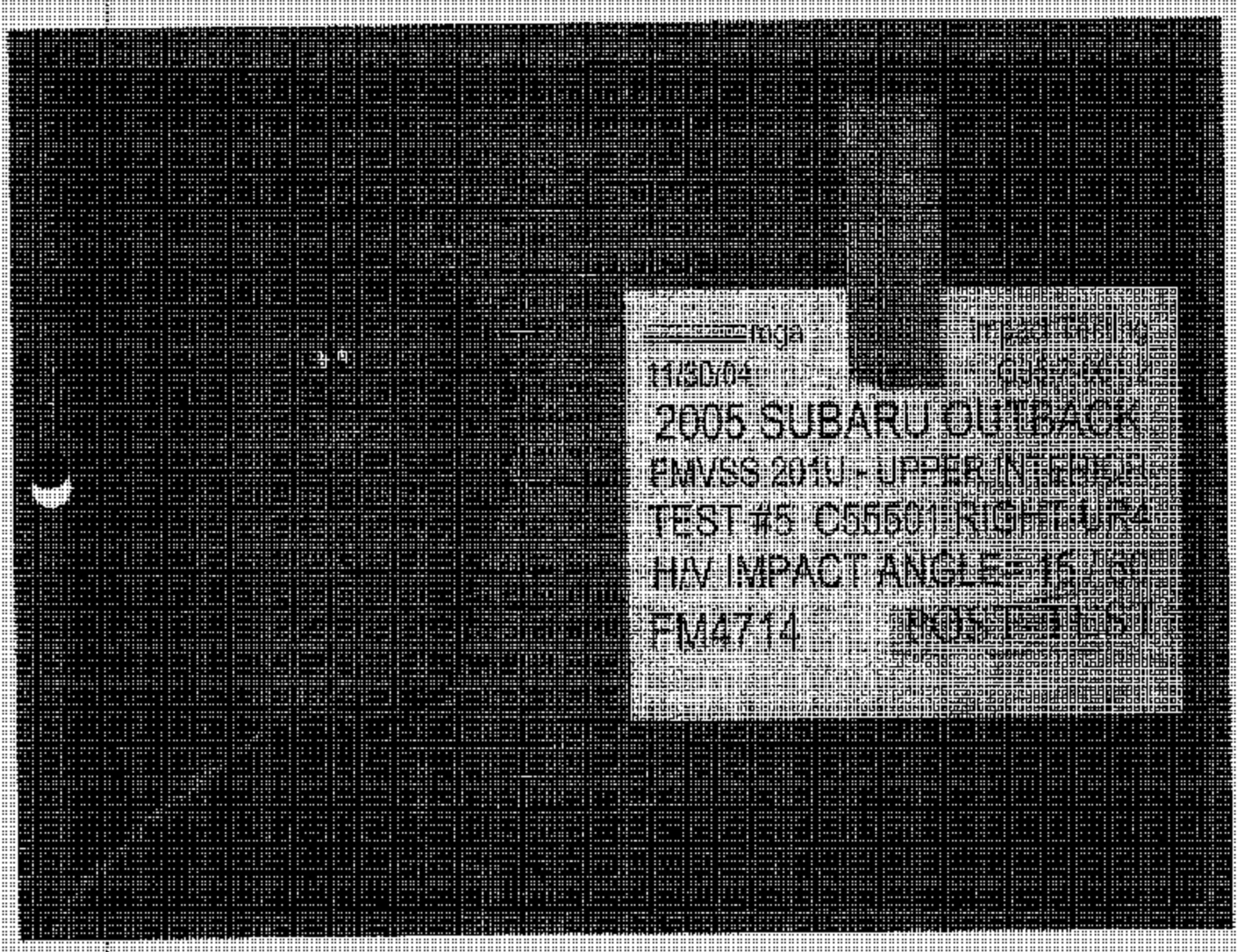
Max Displacement = 40.1 mm @ 8.7 msec



Displacement (mm) vs. Time (msec)






11/3/04
2005 SUBARU OUTBACK
FMVSS 201U - UPPER INTERIOR
TEST #5 C5560 RIGHT SIDE
HIV IMPACT ANGLE=15°
FM4714

MICHIGAN OPERATIONS
DATE: 2/8/01
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3
REVISION NO.: 2
PAGE 1 OF 1

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G05I7-001.2 VEHICLE YR/MAKE/MODEL:2005/Subaru/Outback

GENERAL TEST PARAMETERS:

Target (Vehicle Side): UR4 Right

MGA Test Reference No.:FM4714

Approach Horizontal Angles:15°

Approach Vertical Angles:50°

Additional Description:

Test Number:#5

Temperature:22C

Humidity:31%

Time of Test:4:38 PM

FMH Serial No:035

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
308	188	23.3	24.2	22	7 L

INSTRUMENTAION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	6	J35924	-94.1	1.44	1.44
Y	6	J35919	94.3	1.54	1.54
Z	7	J22664	92.7	1.46	1.17

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage

Recorded By: _____ Approved By*: _____ Date: 11/30/04

*Only necessary for NHTSA (Government) Compliance testing.

FMH
G05I7-001.2

Customer: Subaru
Test # 5
FM4714
Additional Desc: N/A

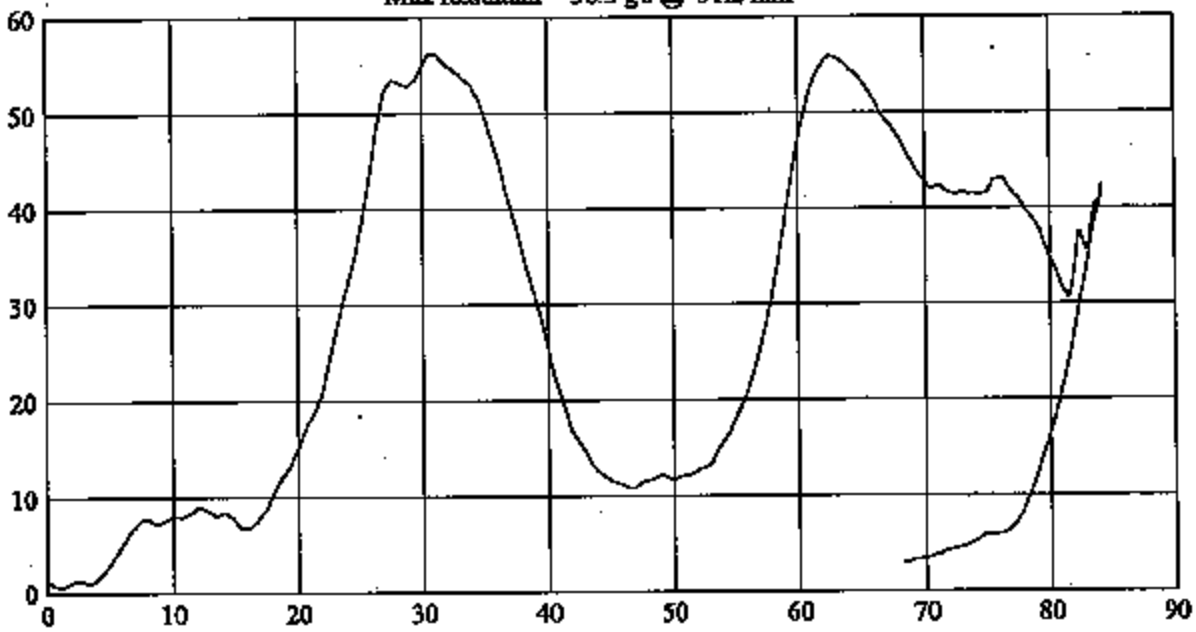
Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005
Target: UR4
Vehicle Side: Right
Horz/Vert Angle: 15/50

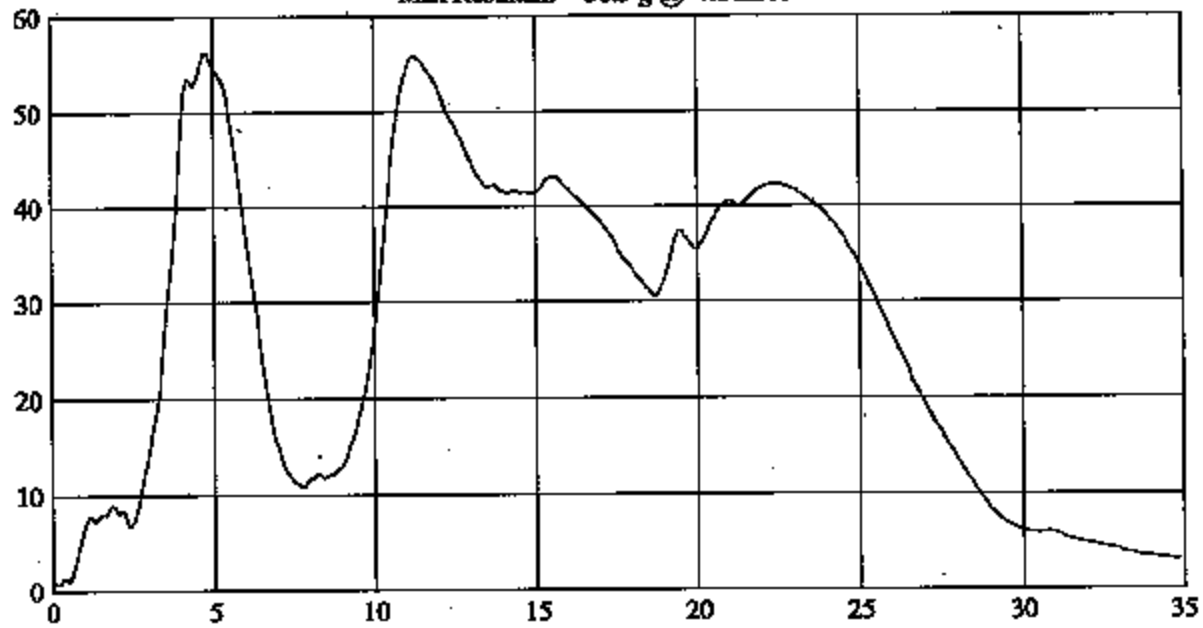
HIC(d) = 308, HIC = 188, Delta T = 23.3 msec

Max Resultant = 56.3 g's @ 31.2 mm



Resultant (g's) vs. Displacement (mm)

Max Resultant = 56.3 g @ 4.8 msec



Resultant Accel (g's) vs. Time (msec)

FMH
G05I7-001.2

Customer: Subaru
Test # 5
FM4714
Additional Desc: N/A

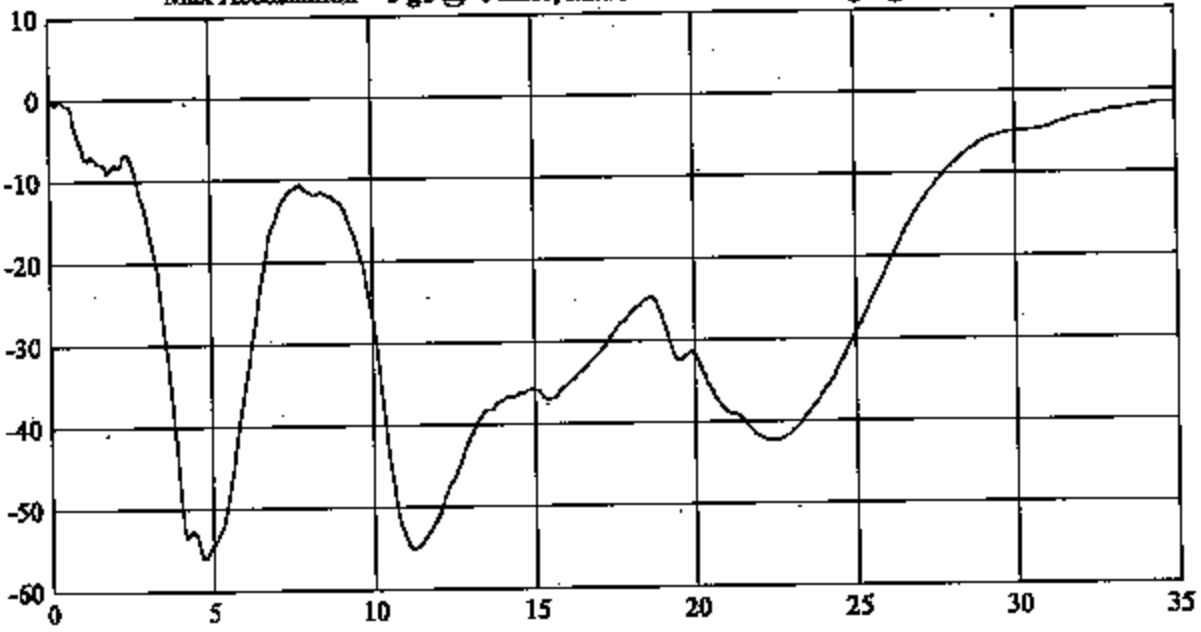
Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005
Target: UR4
Vehicle Side: Right
Horz/Vert Angle: 15/50

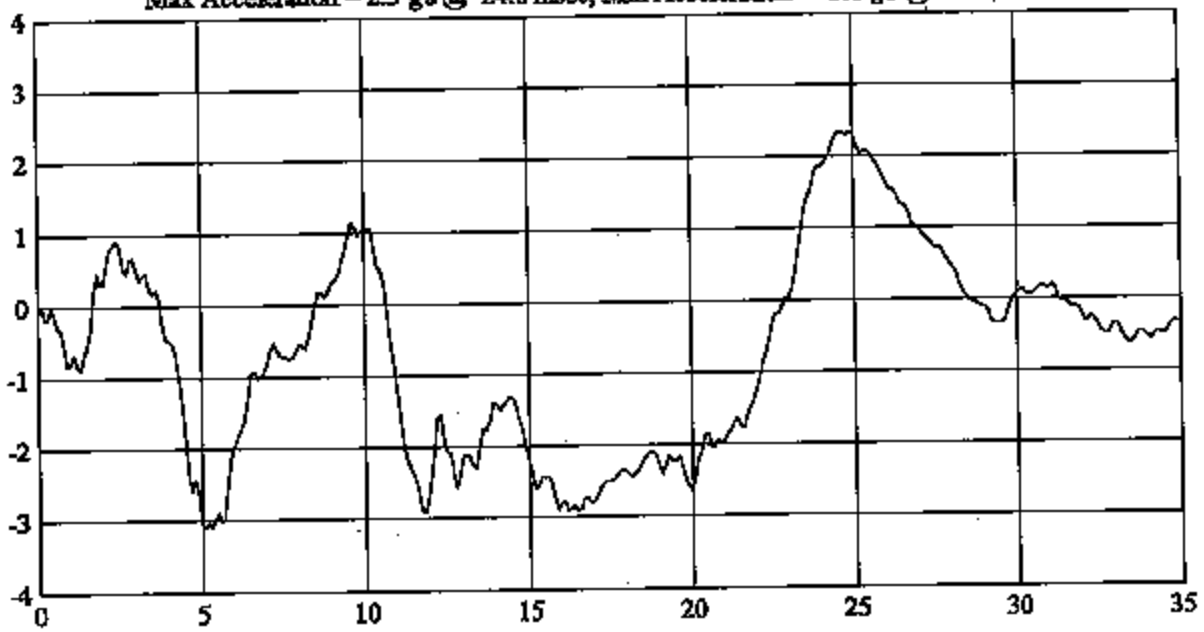
HIC(d) = 308, HIC = 188, Delta T = 23.3 msec

Max Acceleration = 0 g's @ 0 msec, Min Acceleration = -56.1 g's @ 4.8 msec



Accel X (g's) vs. Time (msec)

Max Acceleration = 2.3 g's @ 24.6 msec, Min Acceleration = -3.1 g's @ 5.1 msec



Accel Y (g's) vs. Time (msec)

FMH
G05I7-001.2

Customer: Subaru
Test # 5
FM4714
Additional Desc: N/A

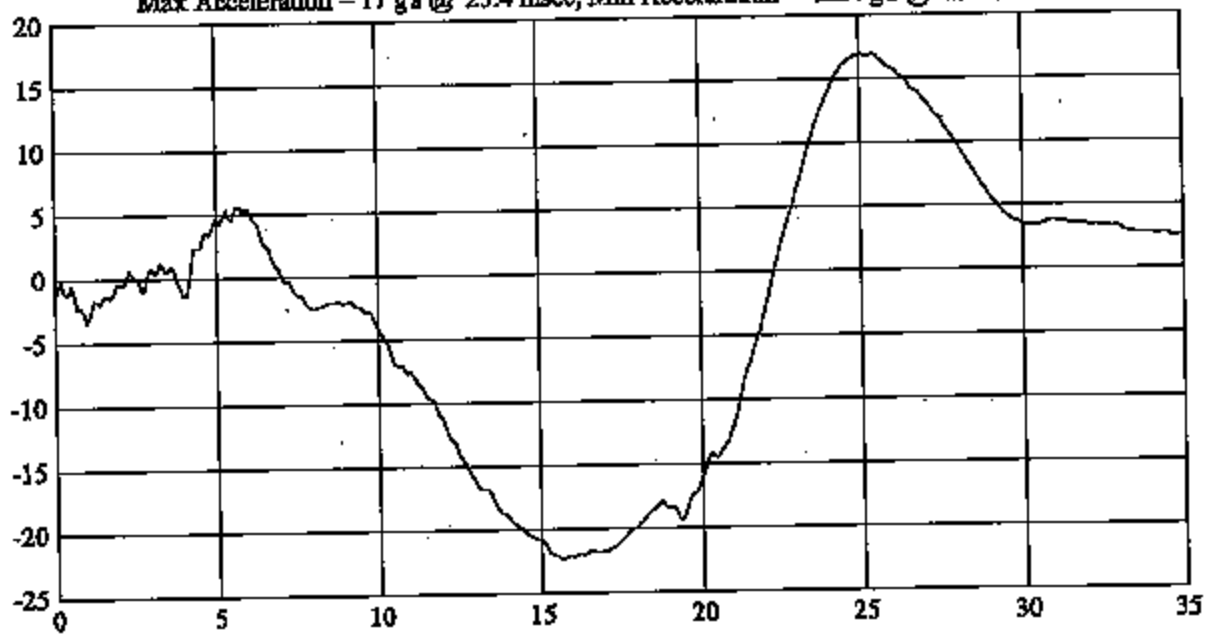
Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005
Target: UR4
Vehicle Side: Right
Horz/Vert Angle: 15/50

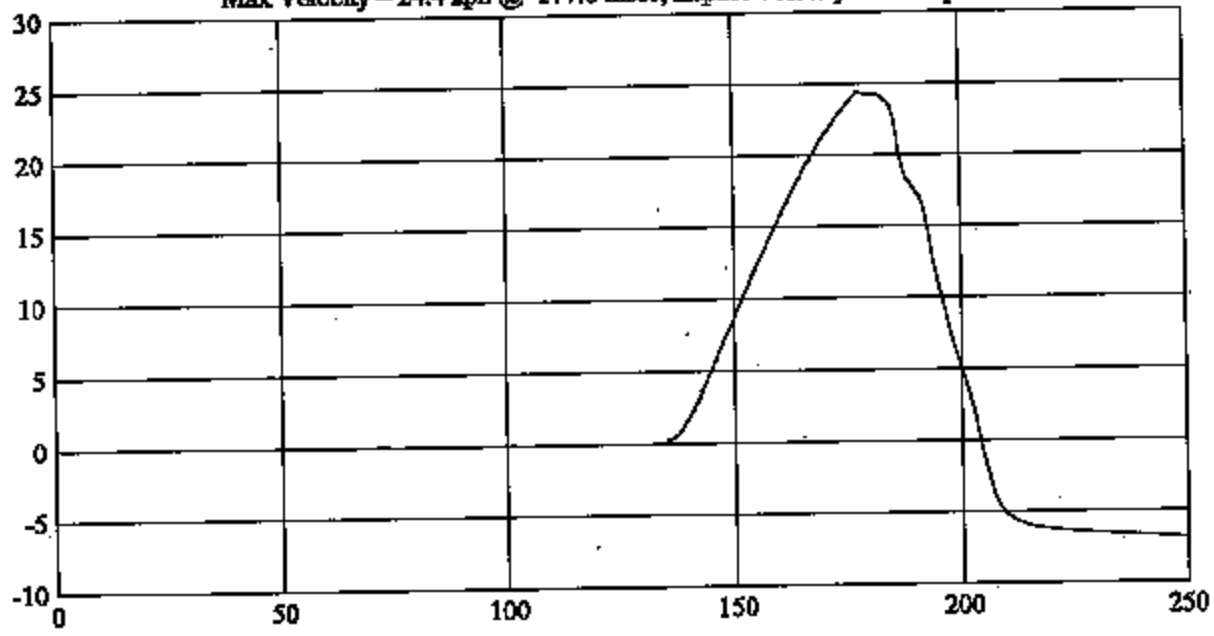
HIC(d) = 308, HIC = 188, Delta T = 23.3 msec

Max Acceleration = 17 g's @ 25.4 msec, Min Acceleration = -22.4 g's @ 15.7 msec



Accel Z (g's) vs. Time (msec)

Max Velocity = 24.4 kph @ 177.8 msec, Impact Velocity = 24.2 kph



Velocity (kph) vs. Time (msec)

FMH
G05I7-001.2

Customer: Subaru
Test # 5
FM4714
Additional Desc: N/A

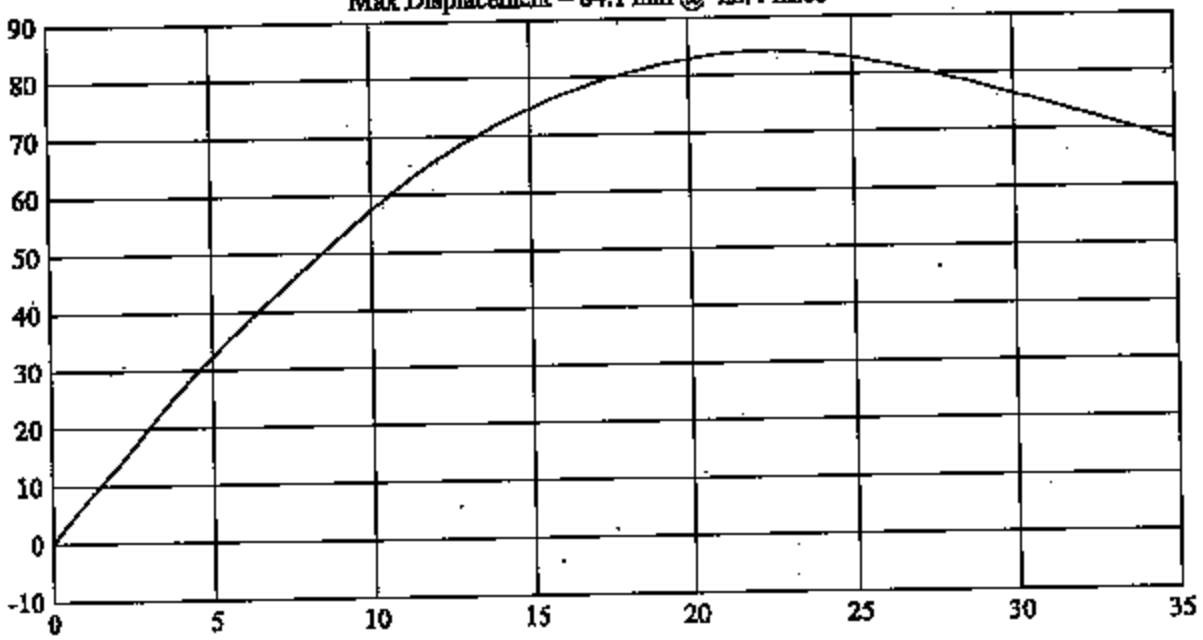
Vehicle Program : Outback

Test Date: 11/30/04

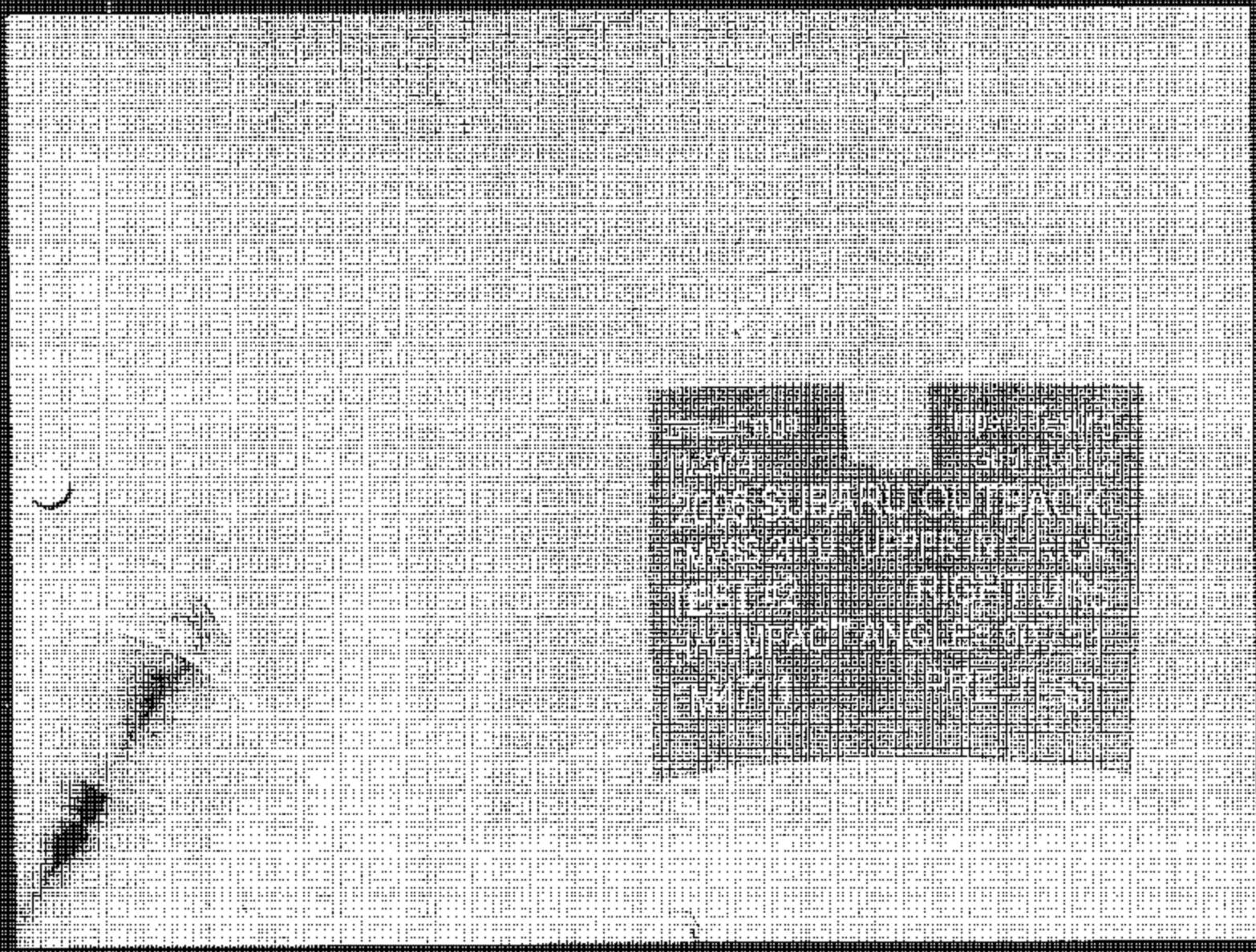
Model Year: 2005
Target: UR4
Vehicle Side: Right
Horz/Vert Angle: 15/50

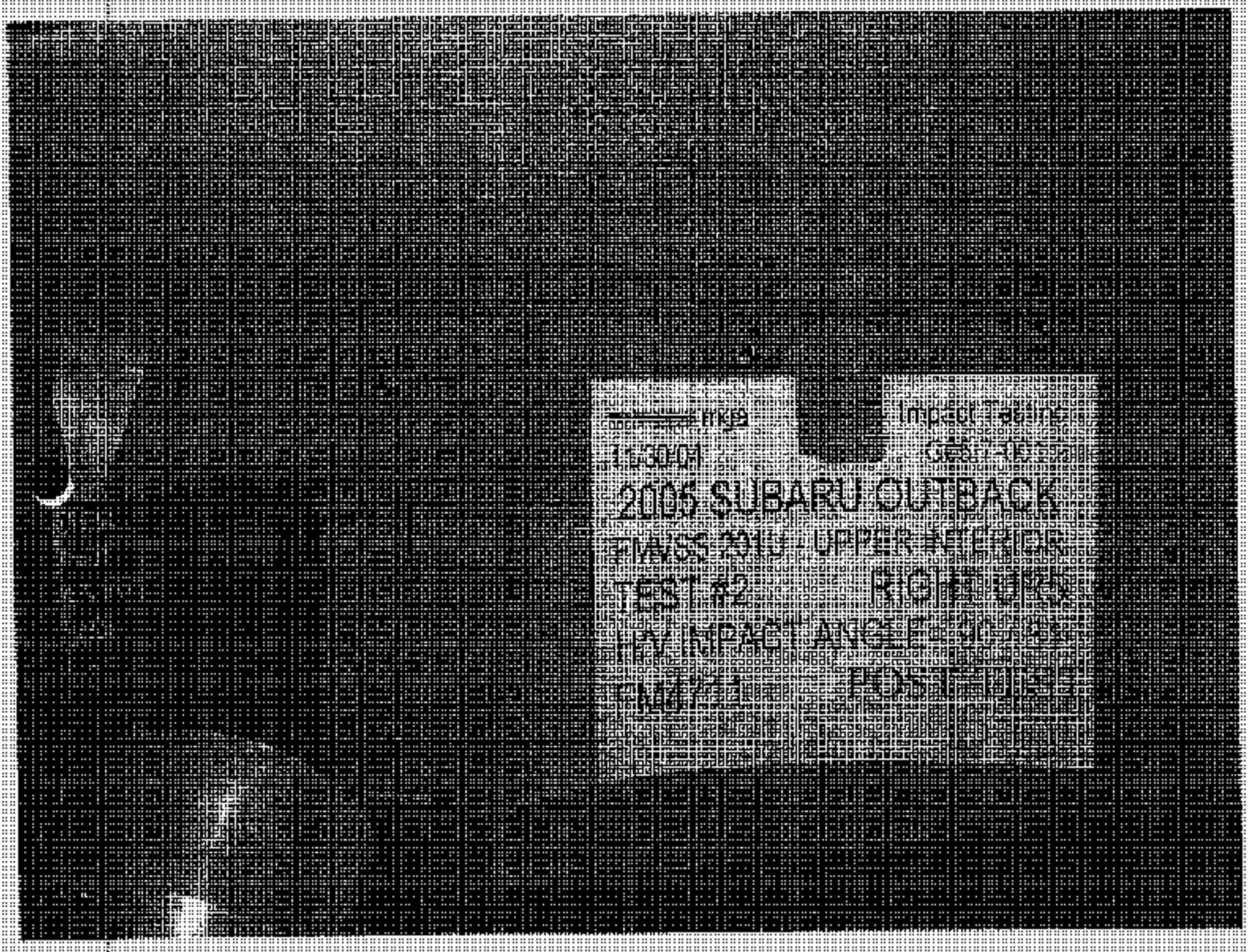
HIC(d) = 308, HIC = 188, Delta T = 23.3 msec

Max Displacement = 84.1 mm @ 22.4 msec



Displacement (mm) vs. Time (msec)




2005 SUBARU OUTBACK
FMVSS 201U UPPER INTERIOR
TEST #2
HIC
FAV IMPACT ANGLE
MPH
POST TEST


2005 SUBARU OUTBACK
FMVSS 201U - UPPER INTERIOR
TEST #2
HIV IMPACT ANGLE - 90°
FW4711

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G05I7-001.2 VEHICLE YR/MAKE/MODEL:2005/Subaru/Outback

GENERAL TEST PARAMETERS:

Target (Vehicle Side): UR5Right

MGA Test Reference No.:FM4711

Approach Horizontal Angles:90°

Approach Vertical Angles:31°

Additional Description:

Test Number:#2

Temperature:22C

Humidity:31%

Time of Test:1:50 PM

FMH Serial No:036

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
679	679	7.8	23.5	40	0

INSTRUMENTAION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35923	-99.8	1.44	1.44
Y	6	J35916	99.7	1.54	1.54
Z	7	J35918	98.1	1.18	1.16

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

Headliner displacement

Recorded By: _____ Approved By*: _____ Date: 11/30/04

*Only necessary for NHTSA (Government) Compliance testing

FMH
G0517-001.2

Customer: Subaru
Test # 2
FM4711
Additional Desc: N/A

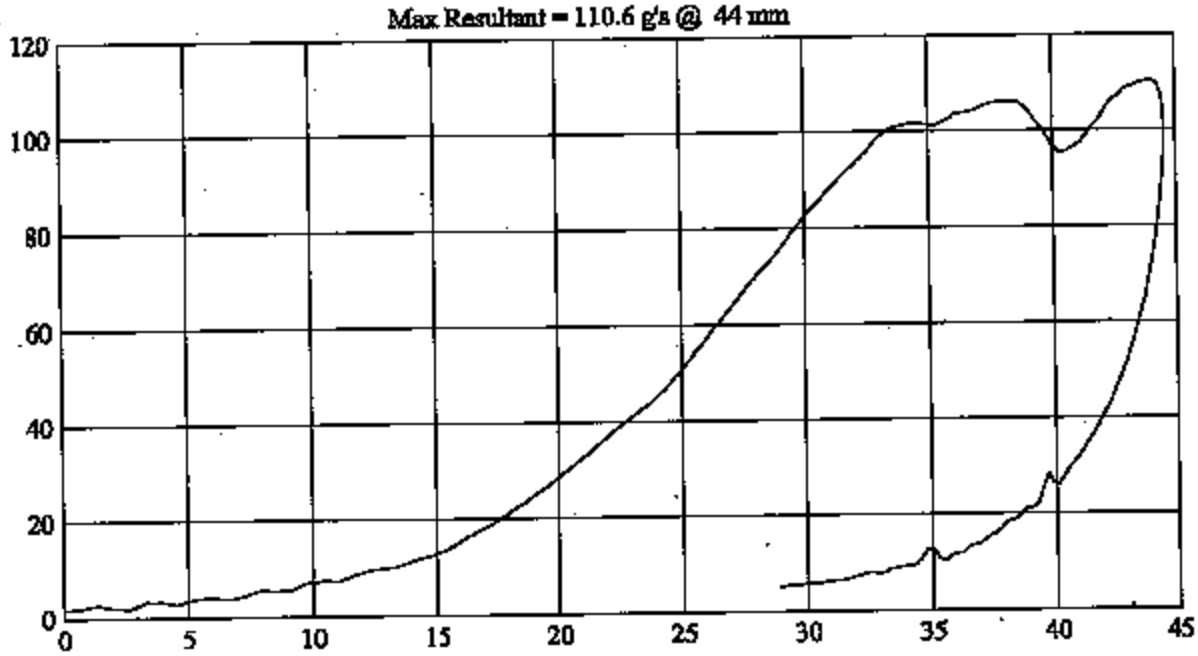
Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005
Target: UR5
Vehicle Side: Right
Horz/Vert Angle: 90/31

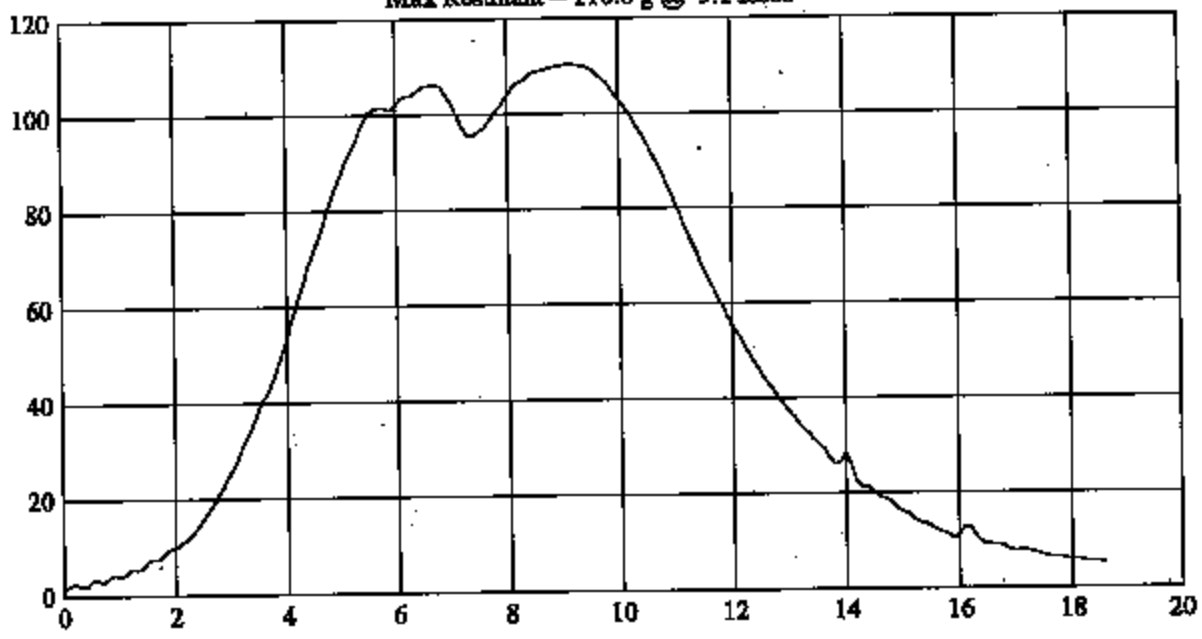
HIC(d) = 679, HIC = 679, Delta T = 7.8 msec

Max Resultant = 110.6 g's @ 44 mm



Resultant (g's) vs. Displacement (mm)

Max Resultant = 110.6 g @ 9.1 msec



Resultant Accel (g's) vs. Time (msec)

FMH
G0517-001.2

Customer: Subaru
Test # 2
FM4711
Additional Desc: N/A

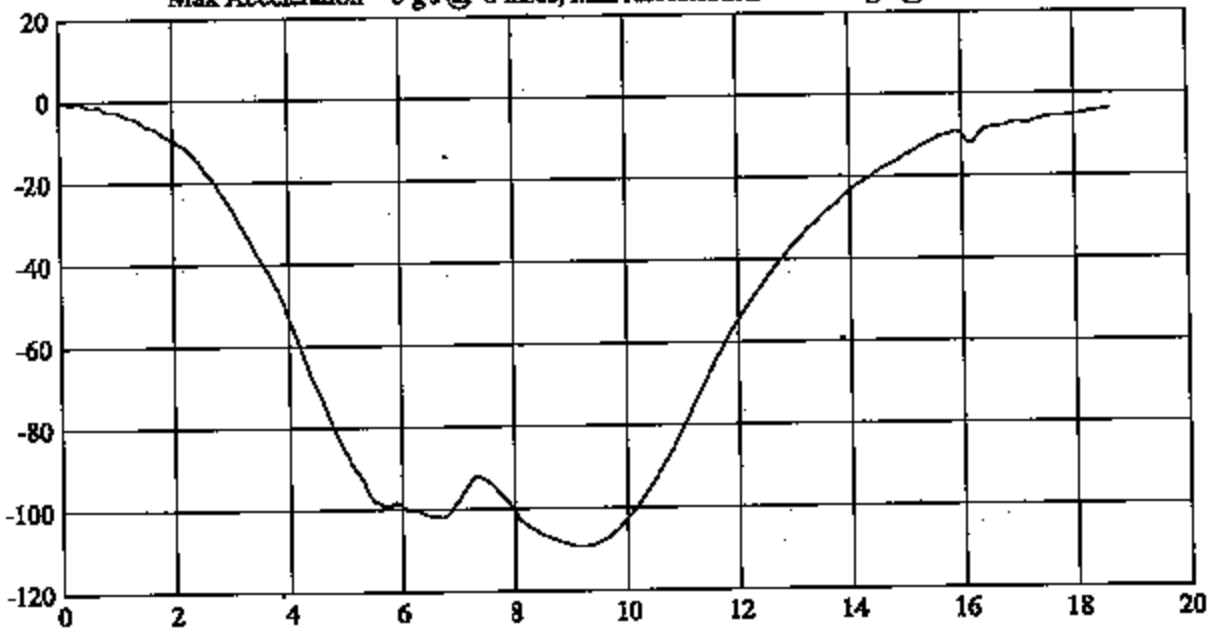
Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005
Target: UR5
Vehicle Side: Right
Horz/Vert Angle: 90/31

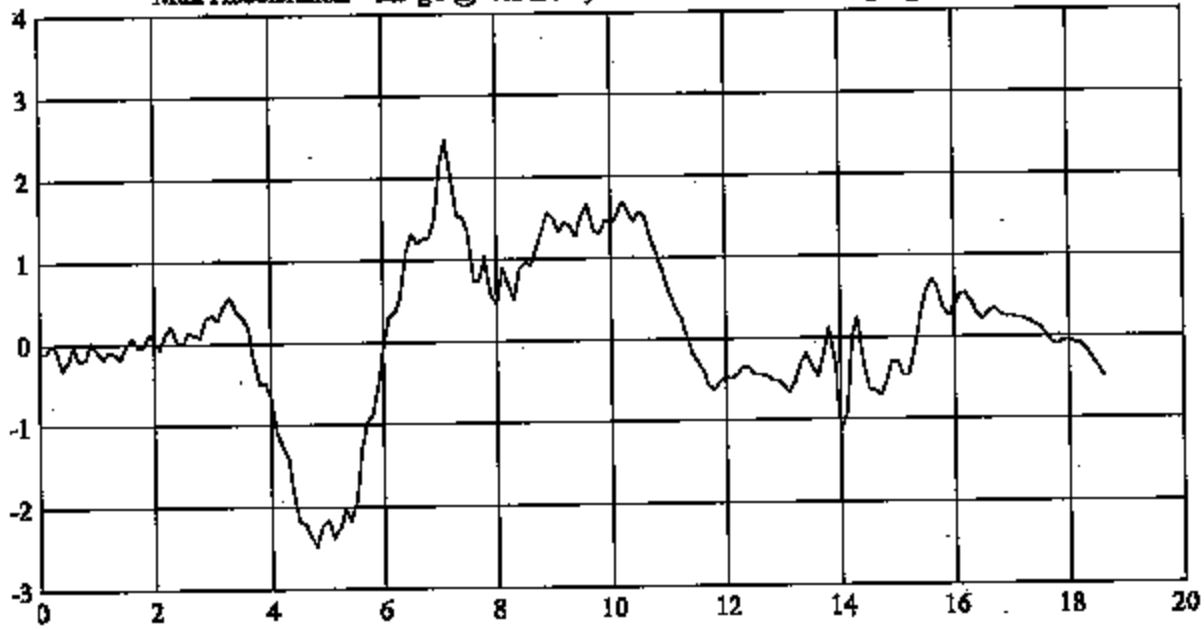
HIC(d) = 679, HIC = 679, Delta T = 7.8 msec

Max Acceleration = 0 g's @ 0 msec, Min Acceleration = -109.4 g's @ 9.1 msec



Accel X (g's) vs. Time (msec)

Max Acceleration = 2.5 g's @ 7.1 msec, Min Acceleration = -2.5 g's @ 4.8 msec



Accel Y (g's) vs. Time (msec)

FMH
G05I7-001.2

Customer: Subaru
Test # 2
FM4711
Additional Desc: N/A

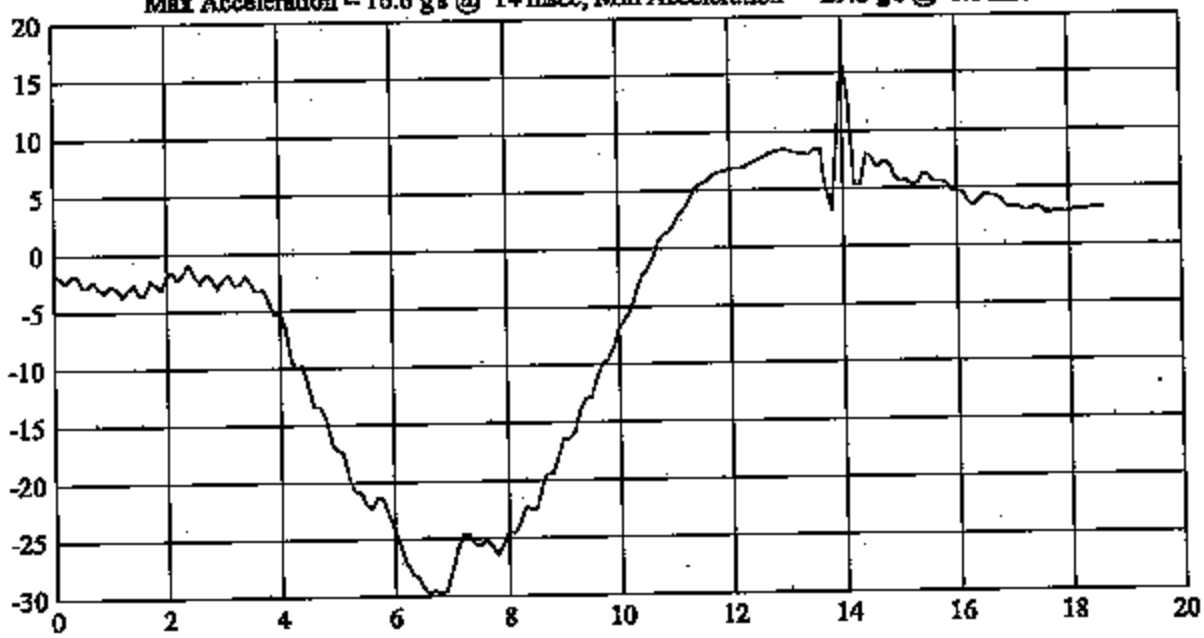
Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005
Target: UR5
Vehicle Side: Right
Horz/Vert Angle: 90/31

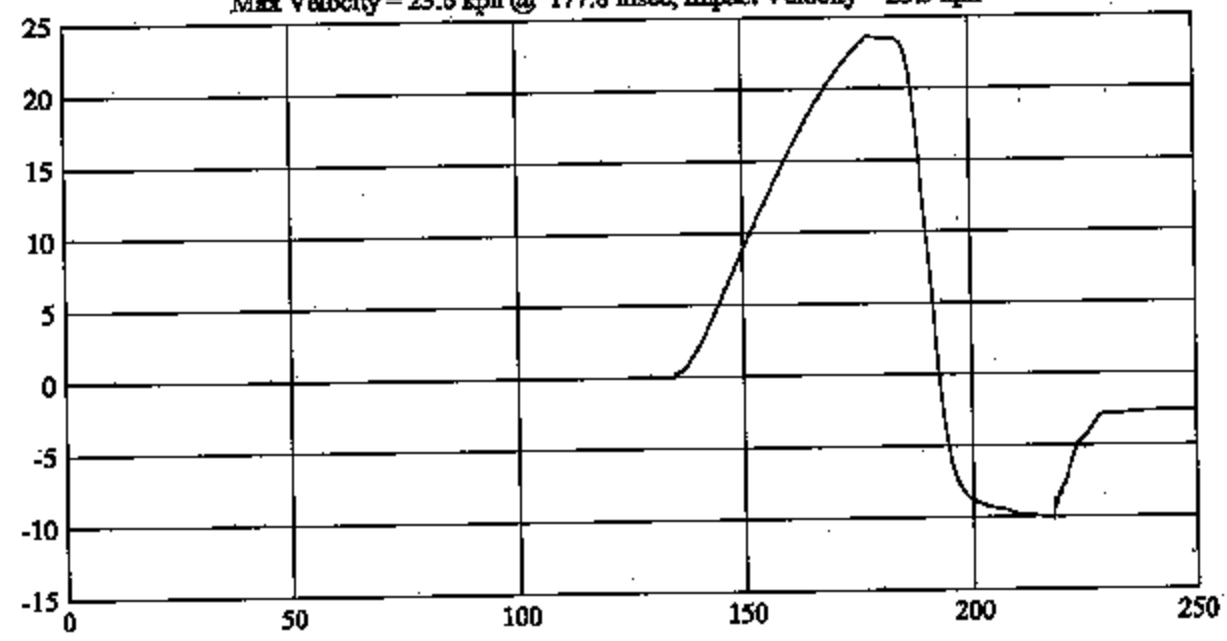
HIC(d) = 679, HIC = 679, Delta T = 7.8 msec

Max Acceleration = 16.6 g's @ 14 msec, Min Acceleration = -29.8 g's @ 6.8 msec



Accel Z (g's) vs. Time (msec)

Max Velocity = 23.6 kph @ 177.8 msec, Impact Velocity = 23.5 kph



Velocity (kph) vs. Time (msec)

FMH
G05I7-001.2

Customer: Subaru
Test # 2
FM4711
Additional Desc: N/A

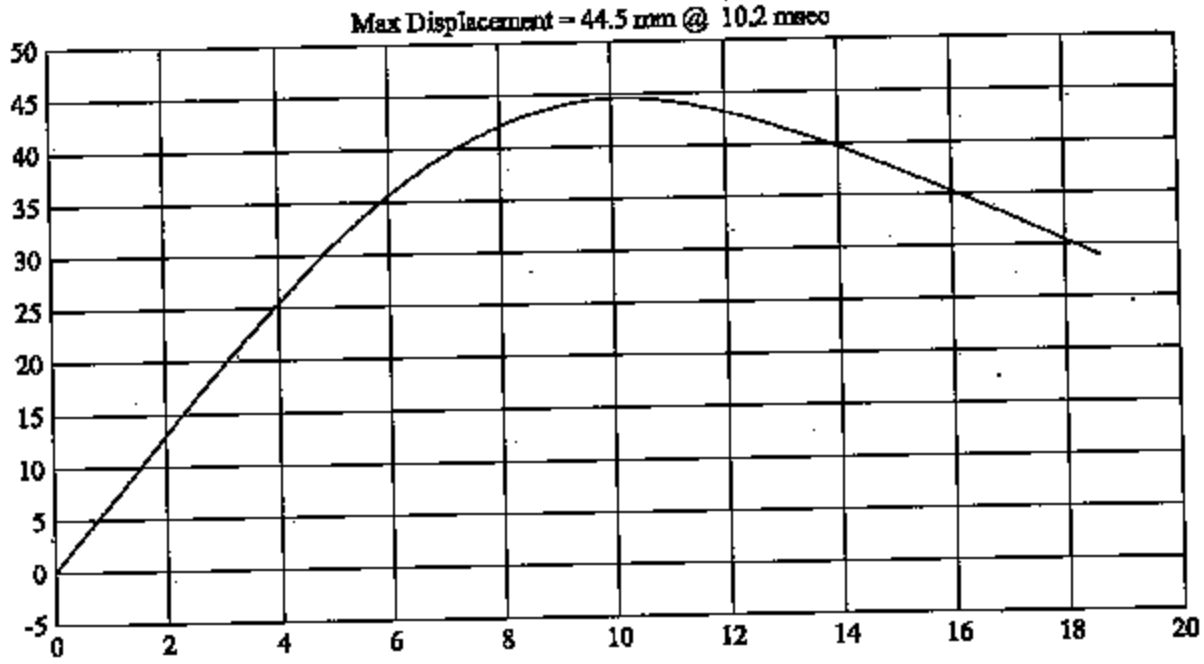
Vehicle Program : Outback

Test Date: 11/30/04

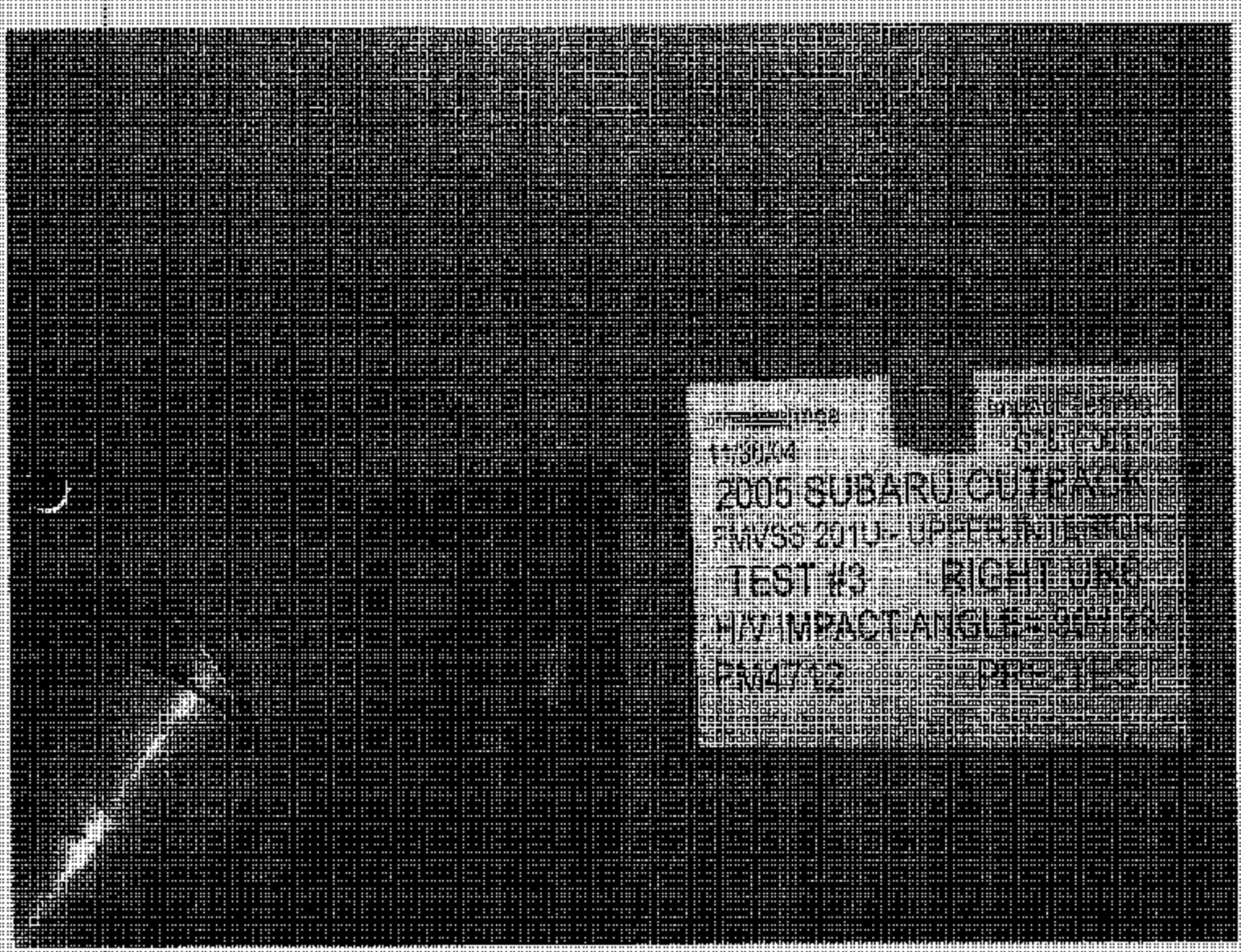
Model Year: 2005
Target: UR5
Vehicle Side: Right
Horz/Vert Angle: 90/31

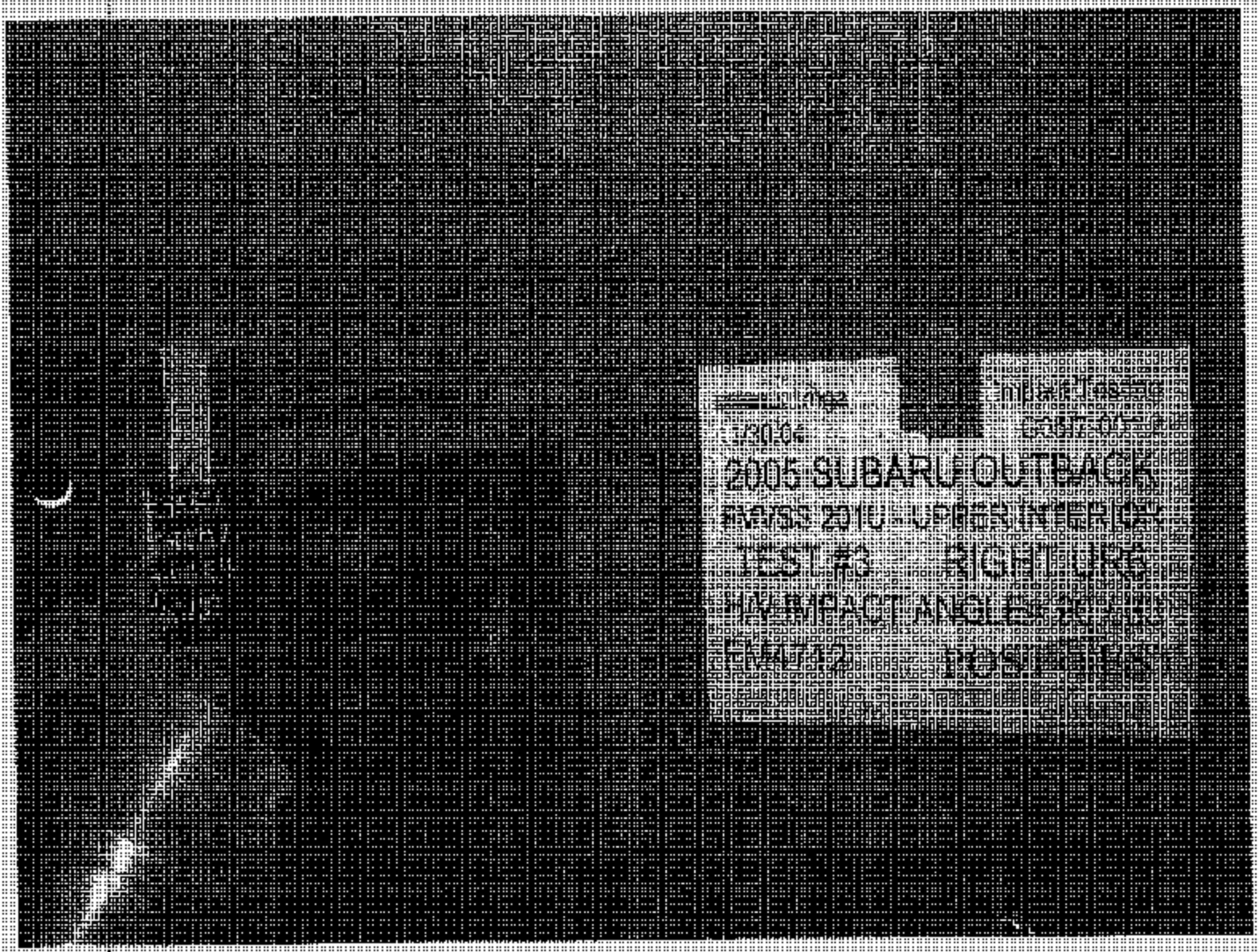
HIC(d) = 679, HIC = 679, Delta T = 7.8 msec

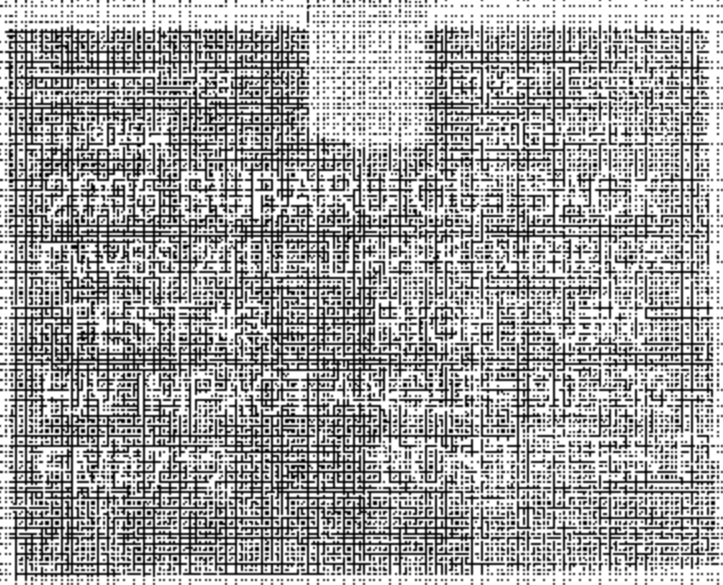
Max Displacement = 44.5 mm @ 10.2 msec



Displacement (mm) vs. Time (msec)


2006 SUBARU OUTBACK
FMVSS 201U- UPPER INTERIOR
TEST #3 RIGHT SIDE
HIV IMPACT ANGLE: 75°
FM4102 DATE: 11-1-


2005 SUBARU OUTBACK
TEST #3 - RIGHT URE
IMPACT ANGLE
POST



MICHIGAN OPERATIONS
DATE: 2/8/01
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3
REVISION NO.: 2
PAGE 1 OF 1

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G05I7-001.2 VEHICLE YR/MAKE/MODEL:2005/Subaru/Outback

GENERAL TEST PARAMETERS:

Target (Vehicle Side): UR6 Right

MGA Test Reference No.:FM4712

Approach Horizontal Angles:90°

Approach Vertical Angles:33°

Additional Description:

Test Number:#3

Temperature:22C

Humidity:31%

Time of Test:2:40 PM

FMH Serial No:037

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
681	683	8.3	23.9	52	13

INSTRUMENTAION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35800	-98.4	1.44	1.44
Y	6	J35841	92.6	1.54	1.54
Z	7	J35791	88.8	1.18	1.18

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

Grab Handle was broken off mount.

Recorded By: _____ Approved By*: _____ Date: 11/30/04

*Only necessary for NHTSA (Government) Compliance testing.

FMH
G0517-001.2

Customer: Subaru
Test # 3
FM4712
Additional Desc: N/A

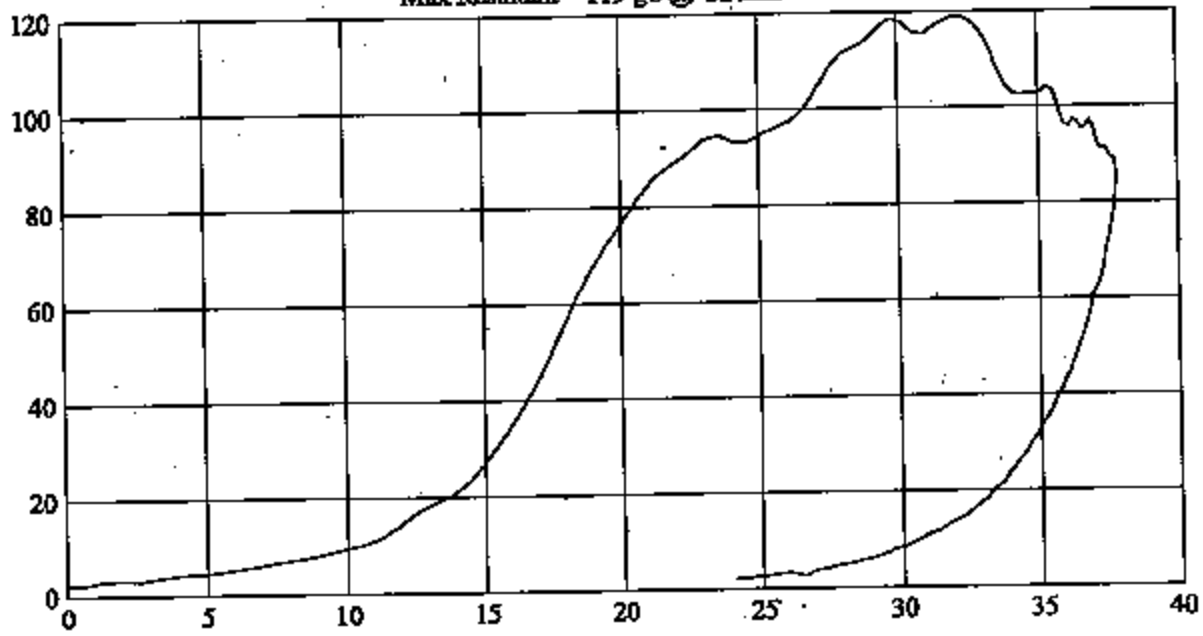
Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005
Target: UR6
Vehicle Side: Right
Horz/Vert Angle: 90/33

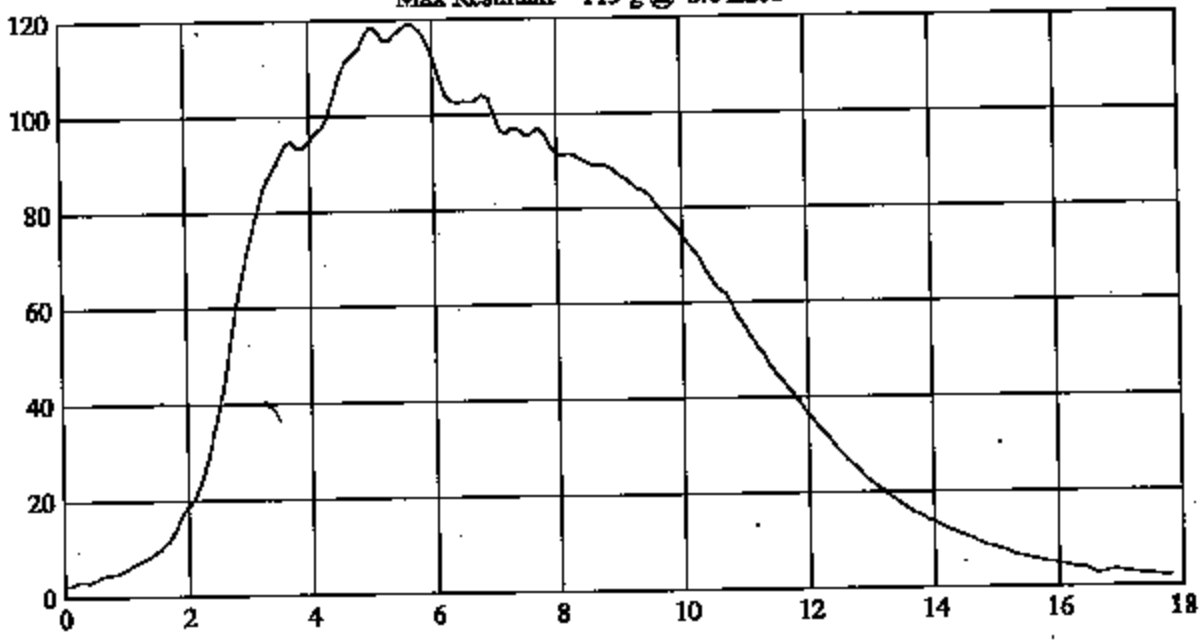
HIC(d) = 681, HIC = 683, Delta T = 8.3 msec

Max Resultant = 119 g's @ 32 mm



Resultant (g's) vs. Displacement (mm)

Max Resultant = 119 g @ 5.6 msec



Resultant Accel (g's) vs. Time (msec)

FMH
G05I7-001.2

Customer: Subaru
Test # 3
FM4712
Additional Desc: N/A

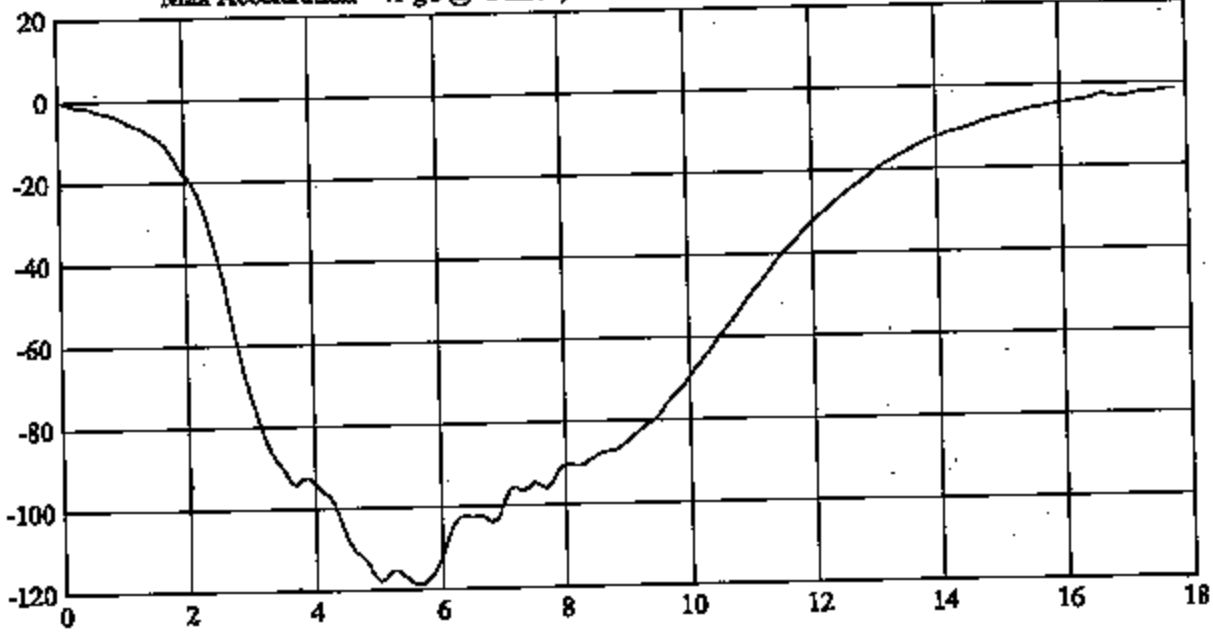
Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005
Target: UR6
Vehicle Side: Right
Horz/Vert Angle: 90/33

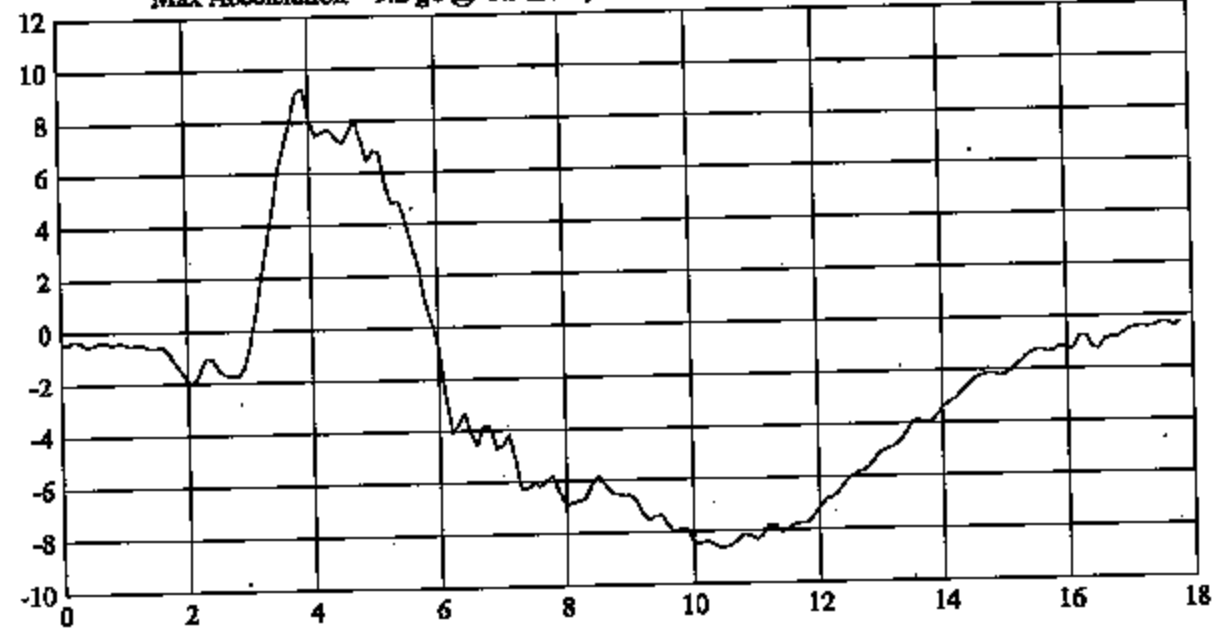
HIC(d) = 681, HIC = 683, Delta T = 8.3 msec

Max Acceleration = -.1 g's @ 0 msec, Min Acceleration = -118.9 g's @ 5.6 msec



Accel X (g's) vs. Time (msec)

Max Acceleration = 9.2 g's @ 3.9 msec, Min Acceleration = -8.6 g's @ 10.5 msec



Accel Y (g's) vs. Time (msec)

FMH
G0517-001.2

Customer: Subaru
Test # 3
FM4712
Additional Desc: N/A

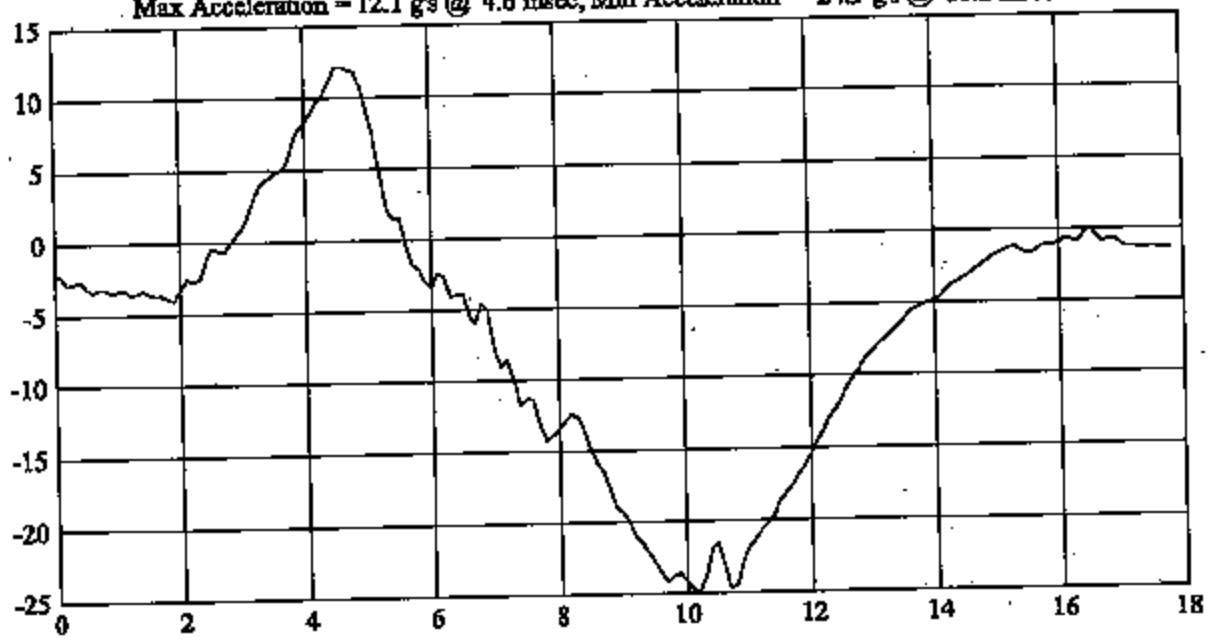
Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005
Target: UR6
Vehicle Side: Right
Horz/Vert Angle: 90/33

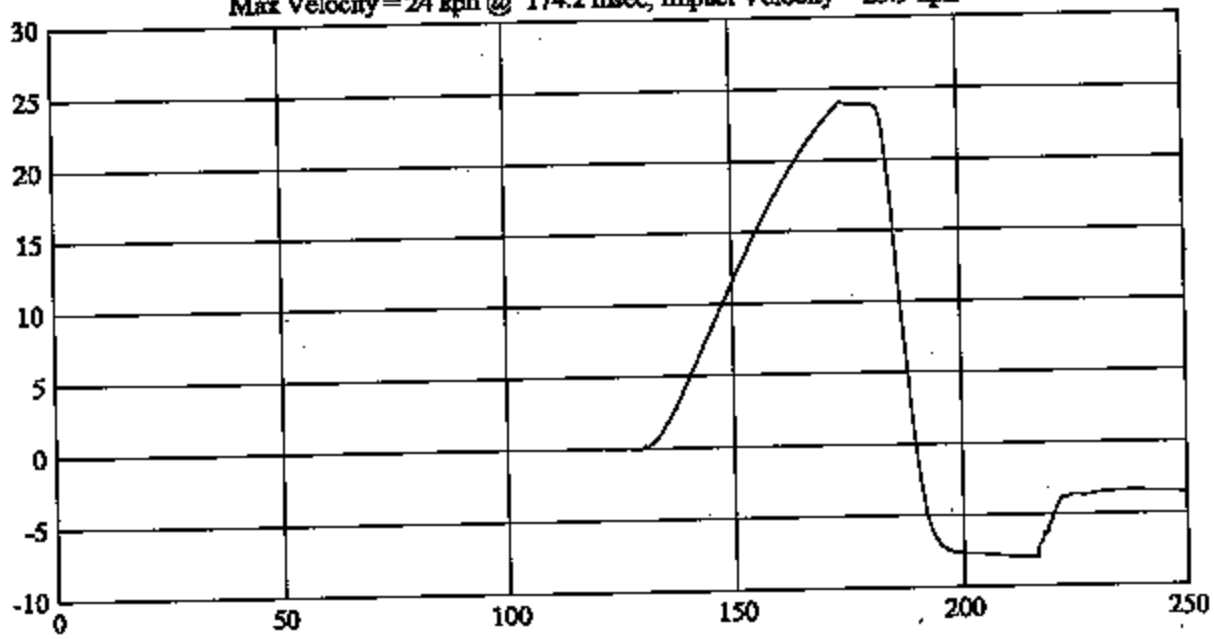
HIC(d) = 681, HIC = 683, Delta T = 8.3 msec

Max Acceleration = 12.1 g's @ 4.6 msec, Min Acceleration = -24.9 g's @ 10.2 msec



Accel Z (g's) vs. Time (msec)

Max Velocity = 24 kph @ 174.2 msec, Impact Velocity = 23.9 kph



Velocity (kph) vs. Time (msec)

FMH
G05I7-001.2

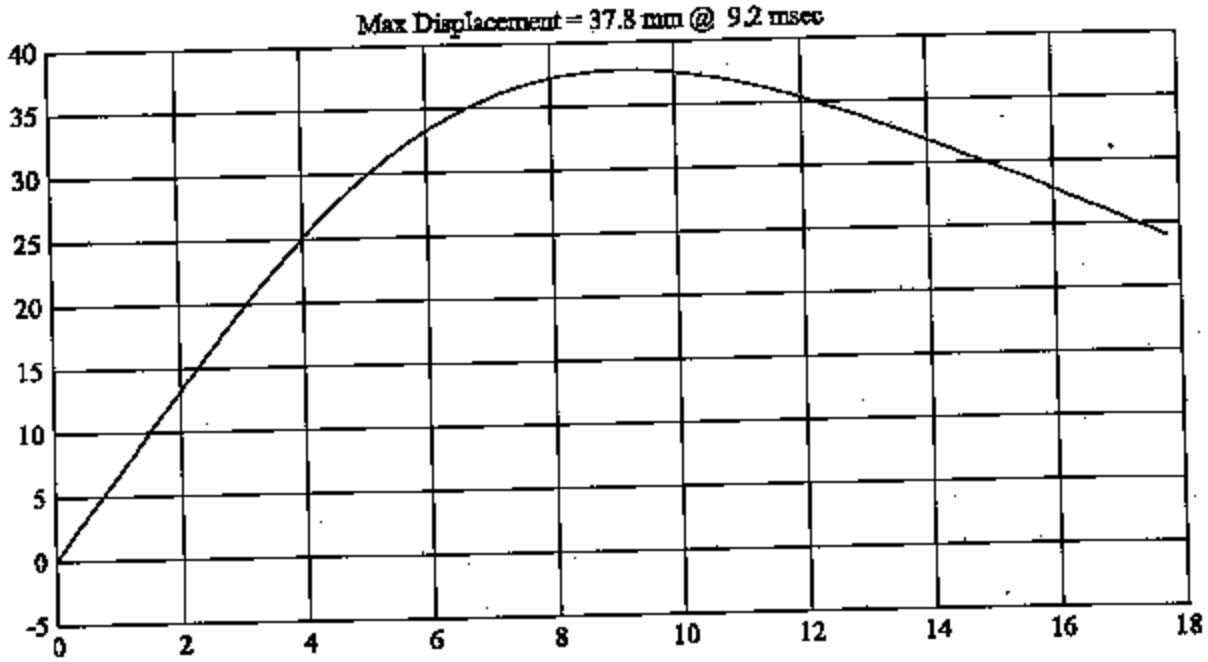
Customer: Subaru
Test # 3
FM4712
Additional Desc: N/A

Vehicle Program : Outback

Test Date: 11/30/04

Model Year: 2005
Target: UR6
Vehicle Side: Right
Horz/Vert Angle: 90/33

HIC(d) = 681, HIC = 683, Delta T = 8.3 msec



4.0 TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

The following section lists the test equipment for the compliance test series. Items marked with an asterisk are calibrated by an external lab. An additional summary table is given for the pre and post-test calibration data for the Free Motion Headforms. The temperature trace to confirm testing was conducted between 66°F and 78°F (19°C - 26°C) is included in Appendix A. Calibration certificates can be found in Appendix B.

TABLE 4-1 LIST OF ITEMS USED

ITEM	MANUFACTURER NAME	MODEL #	FUNCTION OF ITEM	ACCURACY	CAL. INTERNAL
Head Drop Tower (includes test frame and DAS)	MGA Research Corp.	MGA-100-DC	FMH Calibration	N/A	N/A
Accelerometers	Endevco	7264-2000	Acceleration Data	±0.5%	6 months
*Digital Inclinometer	Mitutoyo	PRO 360	Set Angle of FMH/Targeting	0.1°	Annual
FMVSS 201U Test Frame (includes the propulsion control system, actuator, test frame, and DAS)	MGA Research Corp.	MGA-100-FMH	Test System	N/A	N/A
Free Motion Headforms	UTAMA UTAMA UTAMA UTAMA	035 036 037 038	Test Device	N/A	Pre and Post-Test Series
High Speed Video	Kodak	RO1000	Record Event	N/A	N/A
*FARO™	Faro Technologies	G06020203122	Targeting	0.1 mm	Annual
Measuring Devices: - Tape Measure - Plumb Bobs - Protractor	Stanley N/A Mitutoyo	424 -- Pro 360	Measurement Targeting FMH setup Horizontal Measurement	1 mm N/A 0.5°	Annual
*Vehicle Scale	SW Deluxe	26032389	Weighing Vehicle	± .5 kg	Annual
* Scale	Detecto	AP-20	Weigh FMH Head	± 0.01 lb	Annual
*Temperature Recorder	Dickson	TR320	Record Temperature and Humidity	± 1°C ± 1% RH	Annual

TABLE 4-2 FMH CALIBRATION SUMMARY DATA SUMMARY TABLE

FMH Serial #		Weight (lbs)	Temp (°C)	% Humidity	Peak Resultant Acceleration (G's)	Peak Lateral Acceleration (G's)	Unimodal
Pre	#35	10.02	22.0	30.0	235.6	2.2	Yes
Post	#35	10.02	22.0	31.0	249.3	8.6	Yes
Pre	#36	9.98	22.0	30.0	235.9	2.8	Yes
Post	#36	9.98	22.0	31.0	259.1	12.6	Yes
Pre	#37	9.96	22.0	30.0	260.3	11.5	Yes
Post	#37	9.96	22.0	31.0	264.4	7.5	Yes
Pre	#38	9.92	22.0	30.0	250.1	5.9	Yes
Post	#38	9.92	22.0	31.0	242.1	6.3	Yes

Calibration certificates and headform calibration information can be found in the P572L Performance Calibration report which accompanies this report.

RECORDED BY: David G. Gotwals DATE: December 2, 2004

APPROVED BY: Helen A. Kaleto

HEAD DROP TEST SUMMARY
PART 572L

HEADFORM SERIAL NUMBER: 035	CALIBRATION DATE: 11-30-04	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	10.02
Temperature	19° C to 26° C	22
Relative Humidity	10% to 70%	30
Peak Resultant Acceleration	225 G's to 275 G's	235.6
Peak Lateral Acceleration	15 G's Maximum	2.2
Unimodal Acceleration Curve	YES	Yes

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	**Manufacturer**	**Model Number**	**Serial Number**	**Date of Last Calibration**	**Date of Next Calibration**
1	ENDEVCO	7264-2000	J35924	11-9-04 BH	5-9-05
2	ENDEVCO	7264-2000	J35919	11-9-04	5-9-05
3	ENDEVCO	7264-2000	J22664	11-9-04	5-9-05

REMARKS:

RECORDED BY: _____ DATE: 11-30-04

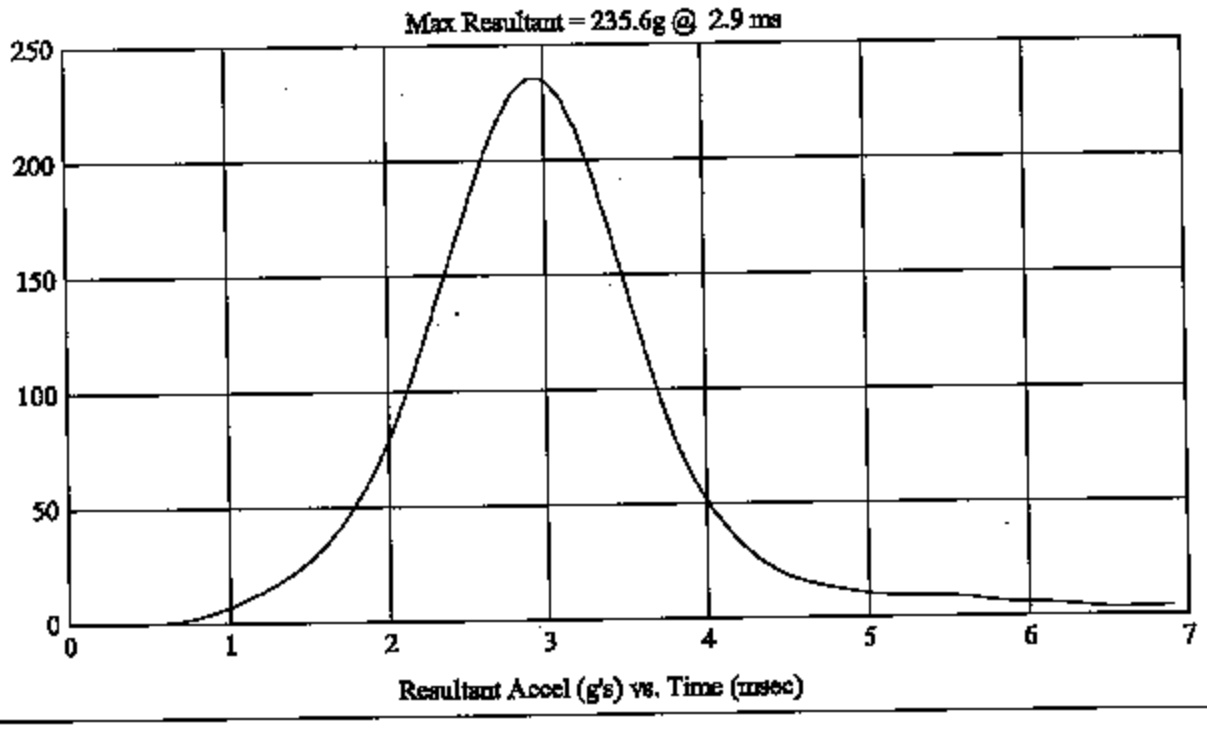
APPROVED BY: _____

Head Drop
(Preliminary Test Report)

Test Number: H35275
Test Description: Pre - Test Calibration

MGA Job Number: G05I7-001.2

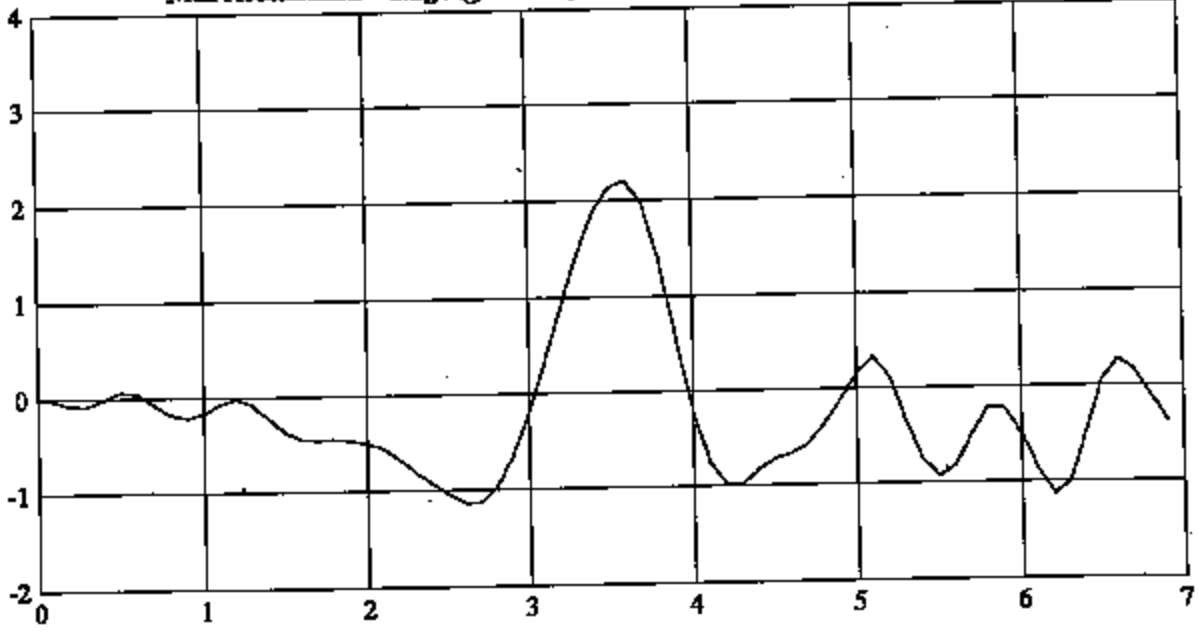
Test Date: 11/30/04
Head # : 35



Head Drop
(Preliminary Test Report)

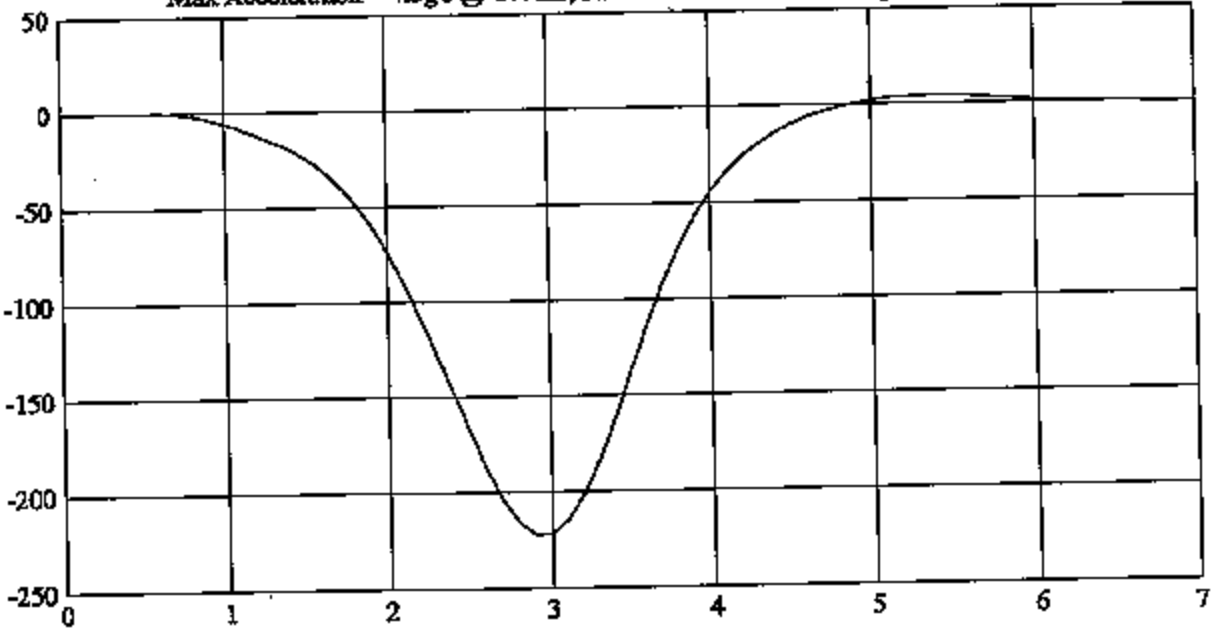
Test Number: H35275 MGA Job Number: G05I7-001.2 Test Date: 11/30/04
Test Description: Pre - Test Calibration Head # : 35

Max Acceleration = 2.2g's @ 3.6 ms, Min Acceleration = -1.1 g's, @ 2.6 ms



Accel Y(g's) vs. Time (msec)

Max Acceleration = 4.3g's @ 5.4 ms, Min Acceleration = -222.3 g's, @ 2.9 ms



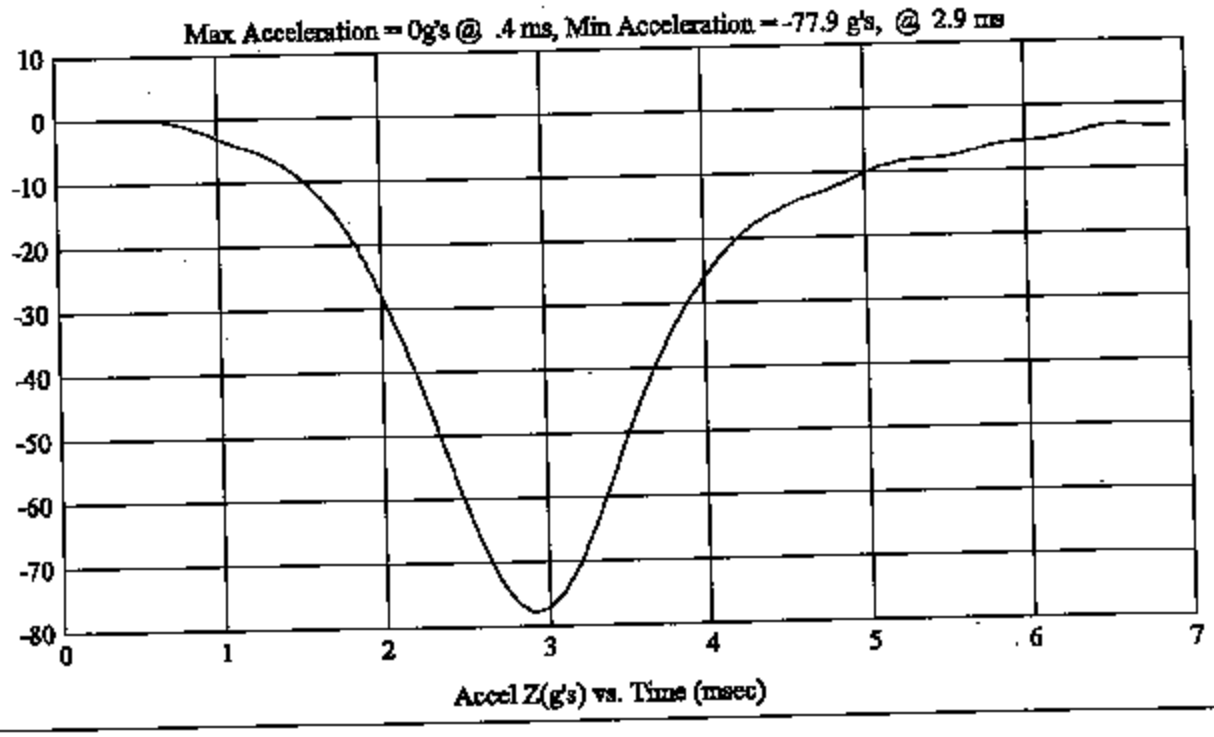
Accel X(g's) vs. Time (msec)

Head Drop
(Preliminary Test Report)

Test Number: H35275
Test Description: Pre - Test Calibration

MGA Job Number: G05I7-001.2

Test Date: 11/30/04
Head # : 35



HEAD DROP TEST SUMMARY
PART 572L

HEADFORM SERIAL NUMBER: 035	CALIBRATION DATE: 12-2-04	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	10.02
Temperature	19° C to 26° C	22
Relative Humidity	10% to 70%	31
Peak Resultant Acceleration	225 G's to 275 G's	243.3
Peak Lateral Acceleration	15 G's Maximum	8.1
Unimodal Acceleration Curve	YES	Yes

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	**Manufacturer**	**Model Number**	**Serial Number**	**Date of Last Calibration**	**Date of Next Calibration**
1	ENDEVCO	7264-2000	J35924	11-9-04	5-9-05
2	ENDEVCO	7264-2000	J35919	11-9-04	5-9-05
3	ENDEVCO	7264-2000	J22664	11-9-04	5-9-05

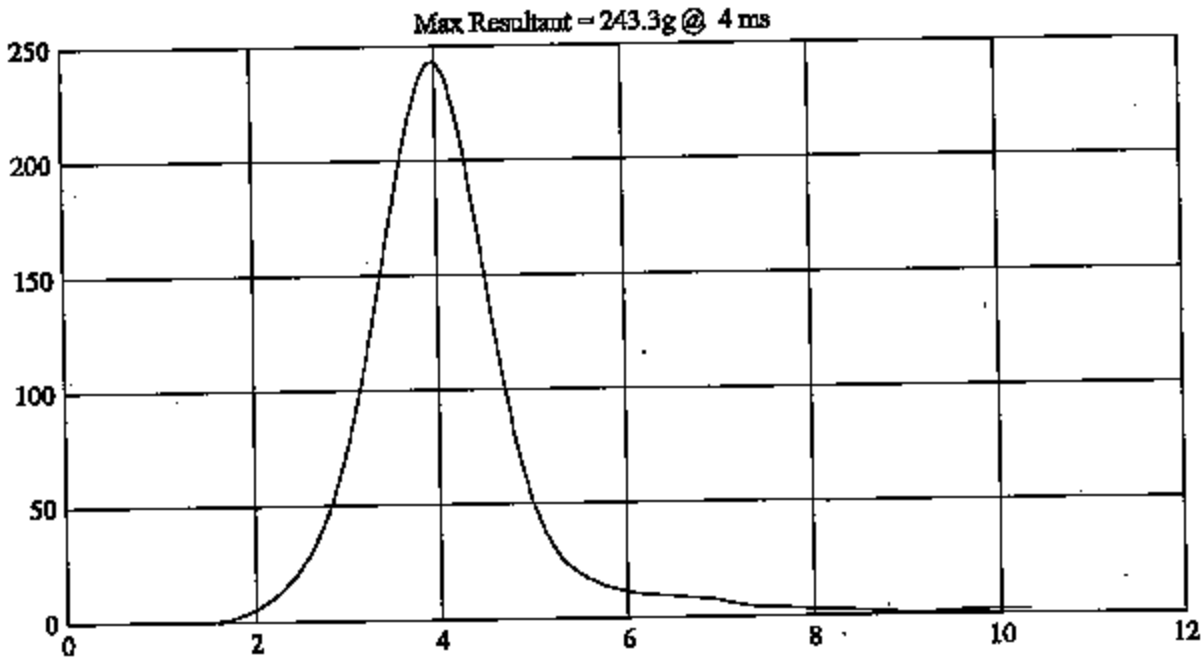
REMARKS:

RECORDED BY: _____ DATE: 12-2-04

APPROVED BY: _____

Head Drop
(Preliminary Test Report)

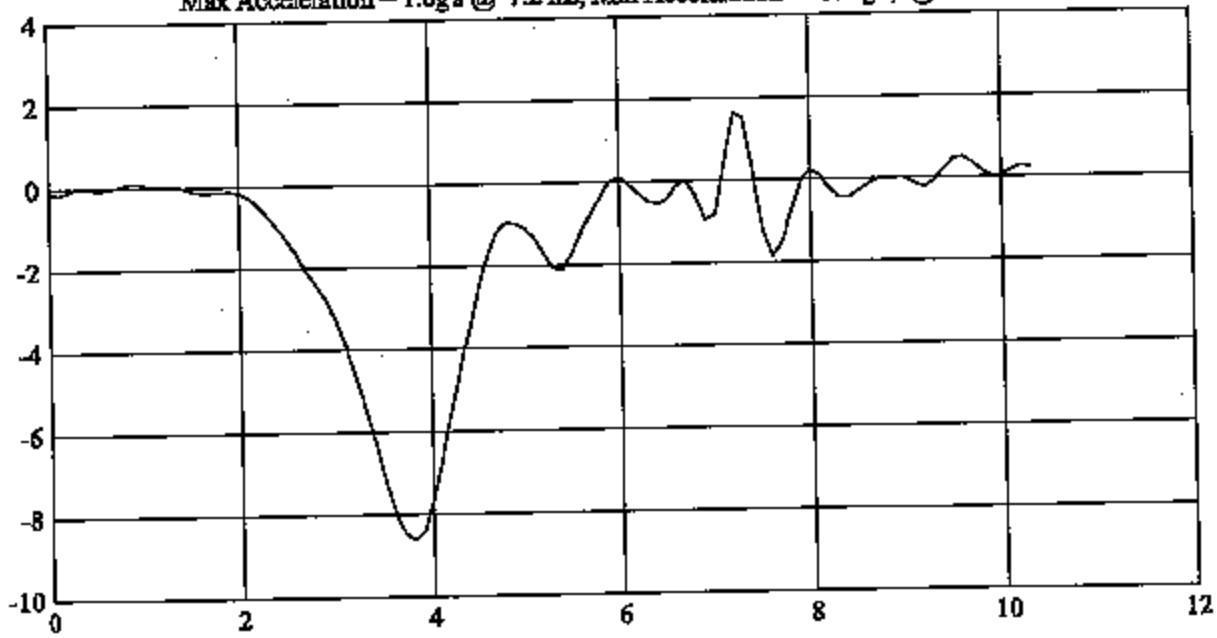
Test Number: H35276 MGA Job Number: G0517-001.2 Test Date: 12/2/04
Test Description: Post - Test Calibration Head # : 35



Head Drop
(Preliminary Test Report)

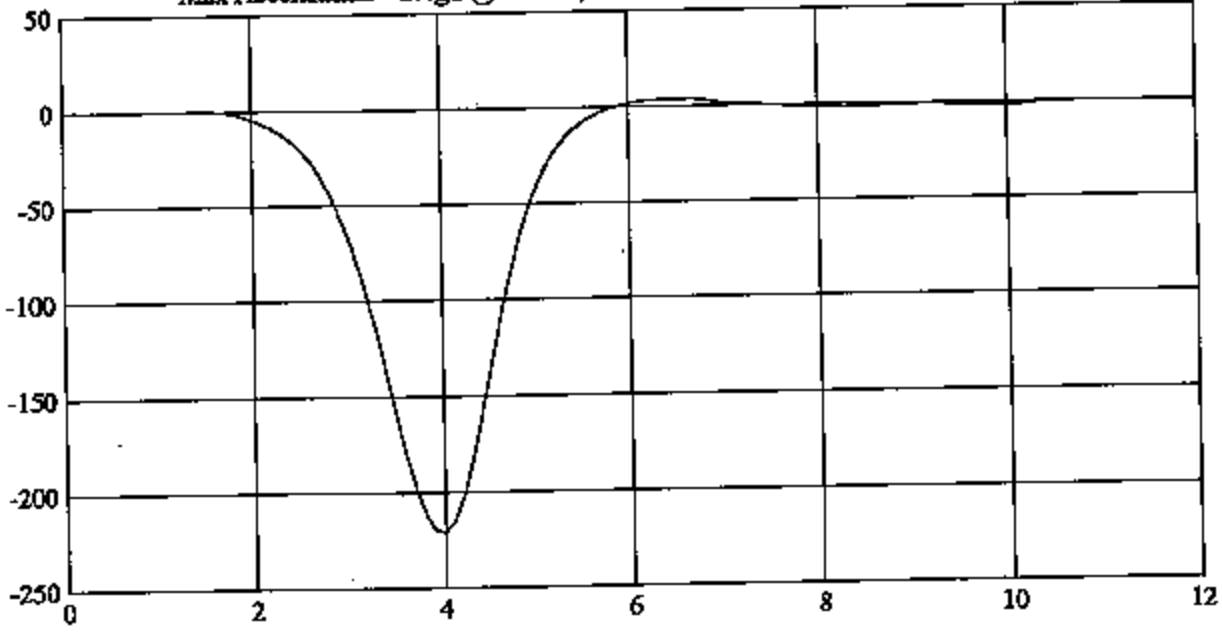
Test Number: H35276 MGA Job Number: G05I7-001.2 Test Date: 12/2/04
Test Description: Post - Test Calibration Head # : 35

Max Acceleration = 1.6g's @ 7.2 ms, Min Acceleration = -8.6 g's, @ 3.8 ms



Accel Y(g's) vs. Time (msec)

Max Acceleration = 3.4g's @ 6.6 ms, Min Acceleration = -221.4 g's, @ 4 ms

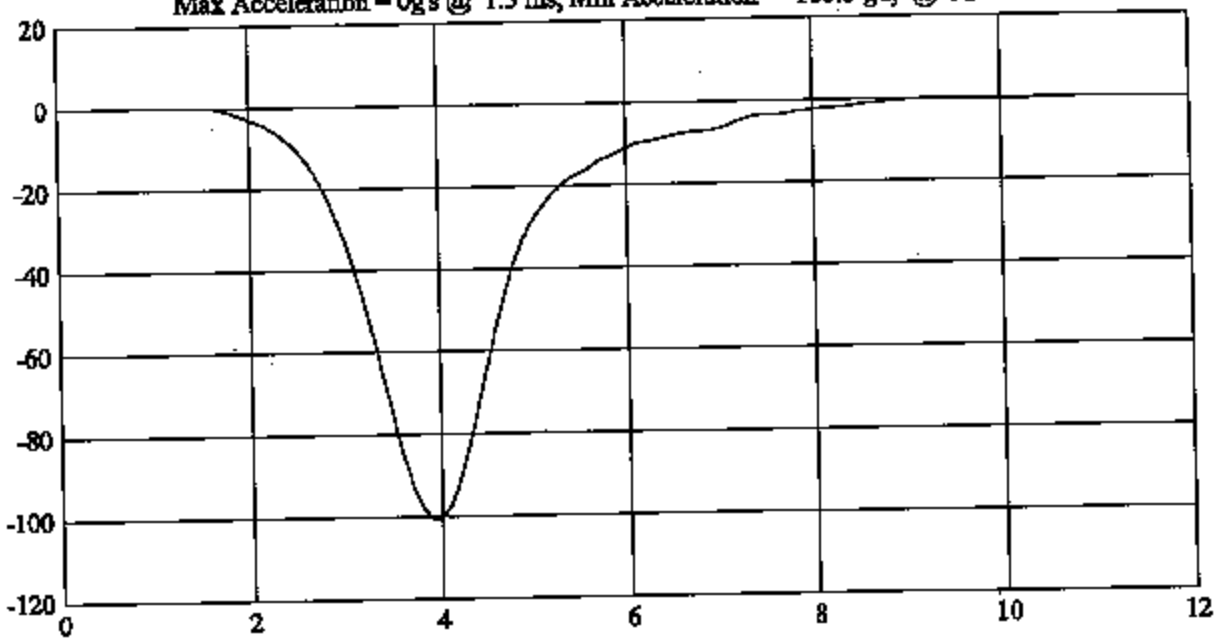


Accel X(g's) vs. Time (msec)

Head Drop
(Preliminary Test Report)

Test Number: H35276 MGA Job Number: G05I7-001.2 Test Date: 12/2/04
Test Description: Post - Test Calibration Head # : 35

Max Acceleration = 0g's @ 1.3 ms, Min Acceleration = -100.5 g's, @ 3.9 ms



Accel Z(g's) vs. Time (msec)

HEAD DROP TEST SUMMARY
PART 572L

HEADFORM SERIAL NUMBER: 036 CALIBRATION DATE: 11-30-04

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	9.98
Temperature	19° C to 26° C	22
Relative Humidity	10% to 70%	30
Peak Resultant Acceleration	225 G's to 275 G's	235.9
Peak Lateral Acceleration	15 G's Maximum	2.8
Unimodal Acceleration Curve	YES	Yes

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	**Manufacturer**	**Model Number**	**Serial Number**	**Date of Last Calibration**	**Date of Next Calibration**
1	ENDEVCO	7264-2000	J35923	11-9-04	5-9-05
2	ENDEVCO	7264-2000	J35916	11-9-04	5-9-05
3	ENDEVCO	7264-2000	J35918	11-9-04	5-9-05

REMARKS:

RECORDED BY: _____ DATE: 11-30-04

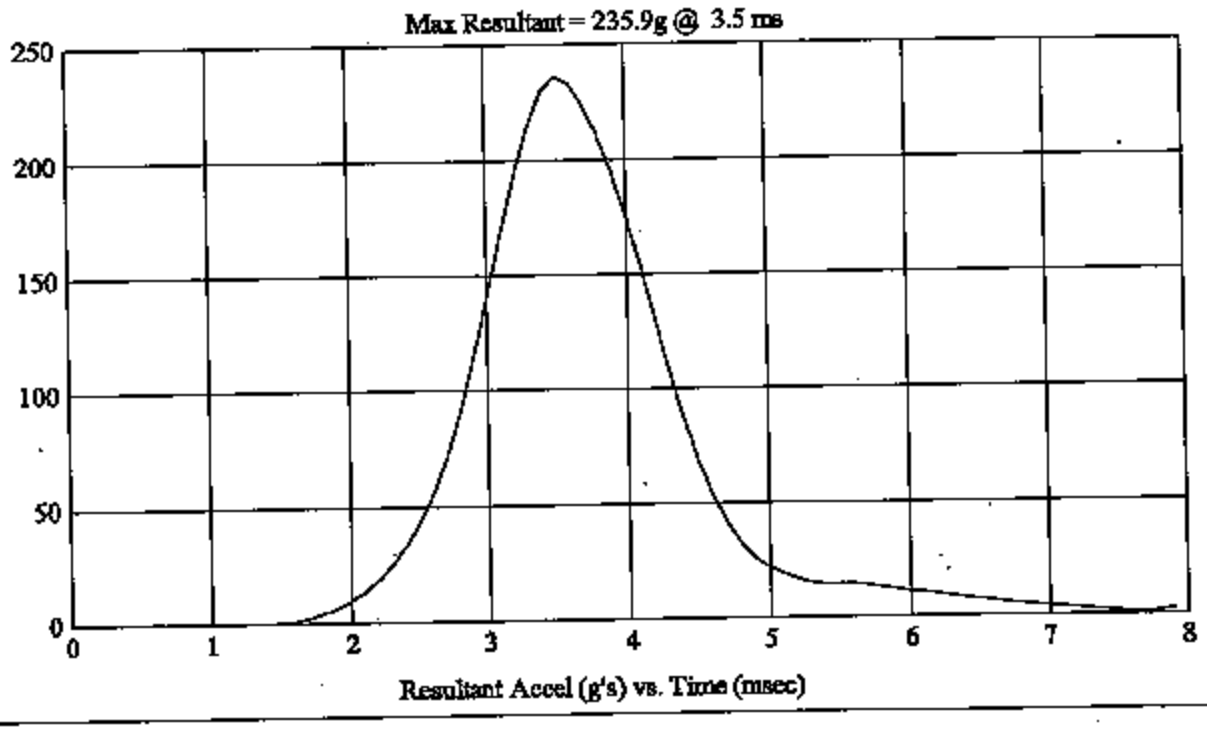
APPROVED BY: _____

Head Drop
(Preliminary Test Report)

Test Number: H36273
Test Description: Pre - Test Calibration

MGA Job Number: G05I7-001.2

Test Date: 11/30/04
Head # : 36



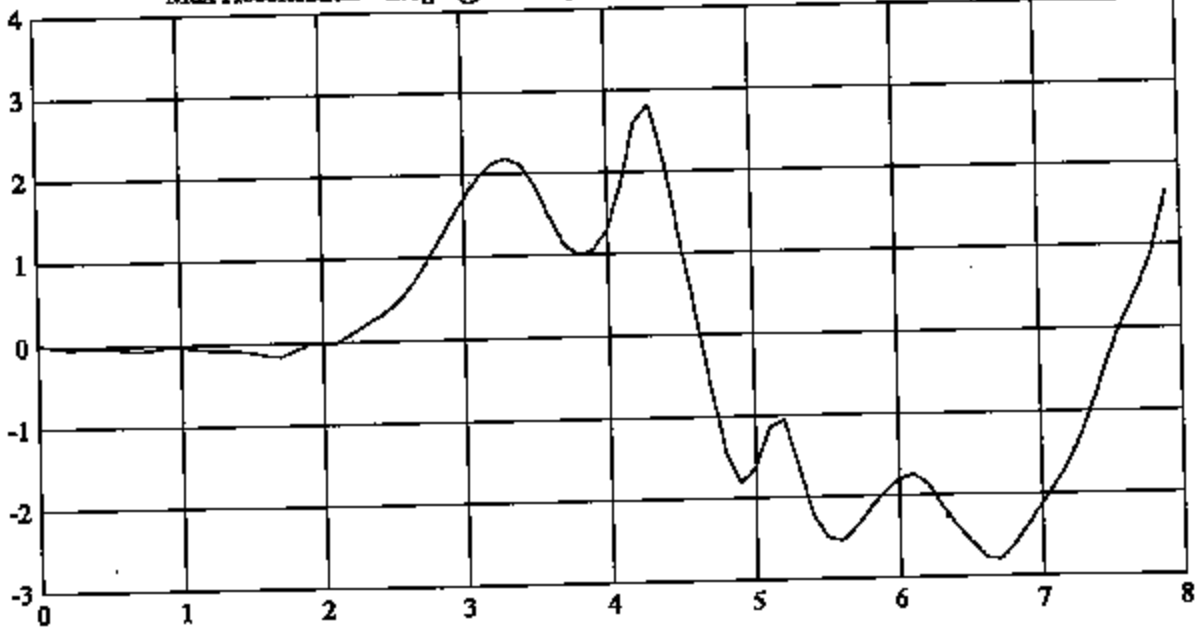
Head Drop
(Preliminary Test Report)

Test Number: H36273
Test Description: Pre - Test Calibration

MGA Job Number: G05I7-001.2

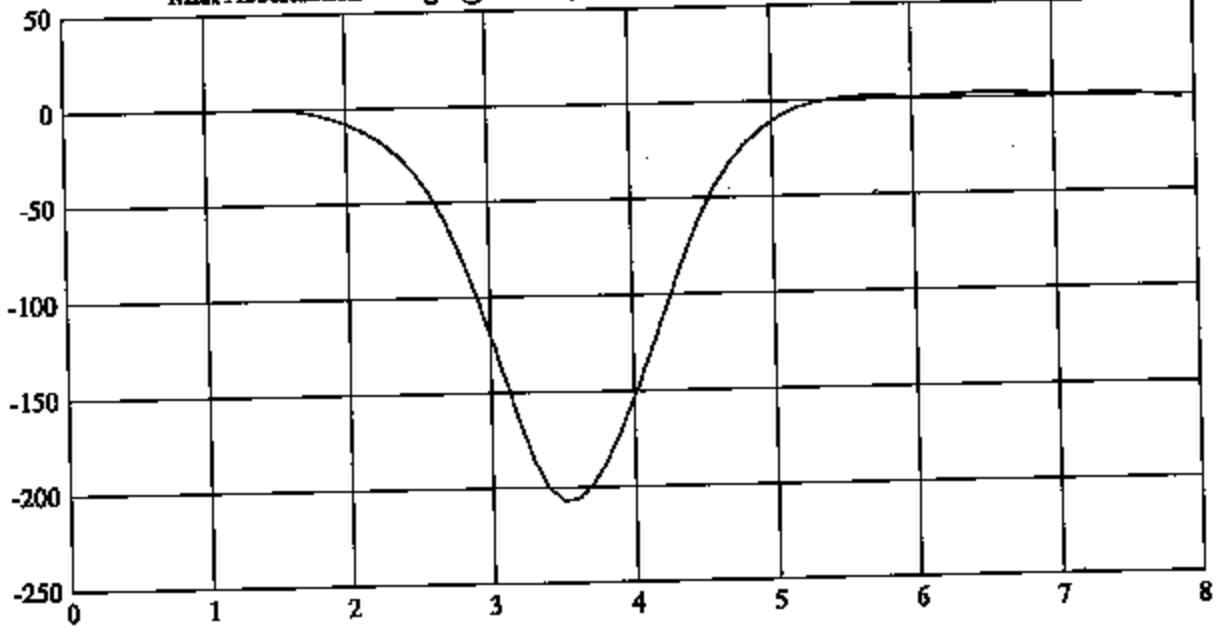
Test Date: 11/30/04
Head # : 36

Max Acceleration = 2.8g's @ 4.3 ms, Min Acceleration = -2.8 g's, @ 6.7 ms



Accel Y(g's) vs. Time (msec)

Max Acceleration = 2.4g's @ 6.5 ms, Min Acceleration = -207.4 g's, @ 3.5 ms



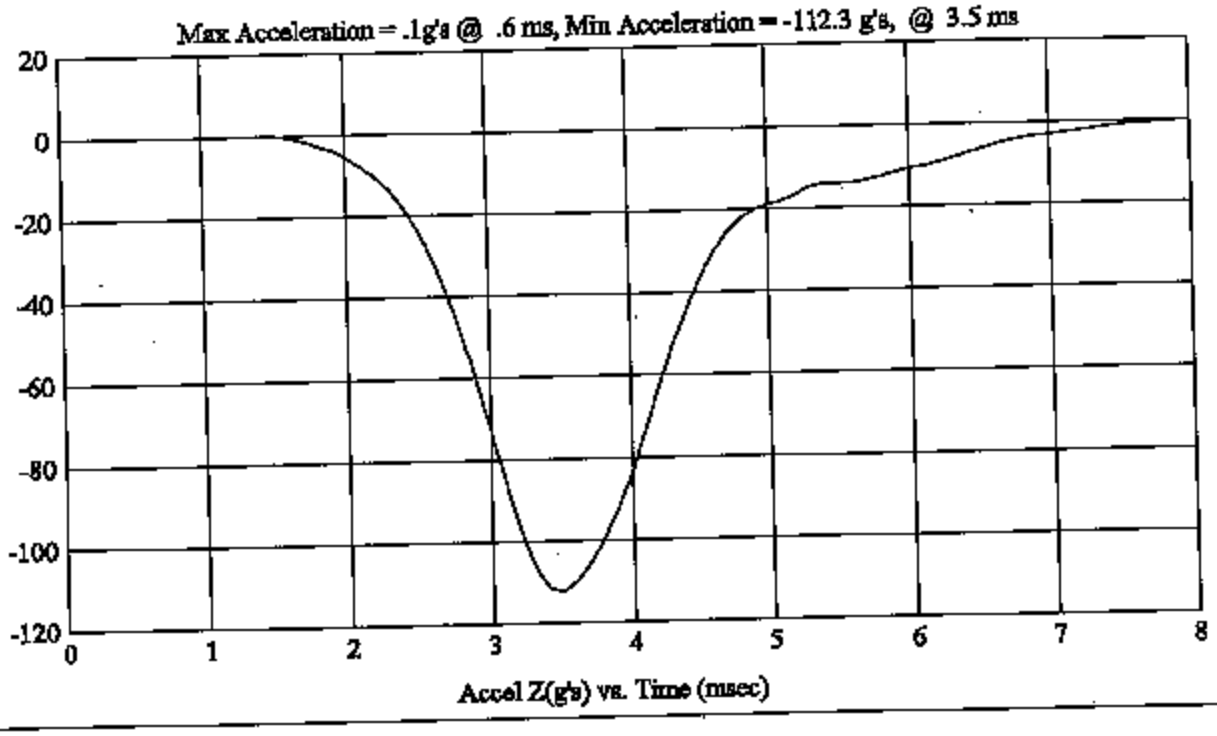
Accel X(g's) vs. Time (msec)

Head Drop
(Preliminary Test Report)

Test Number: H36273
Test Description: Pre - Test Calibration

MGA Job Number: G05I7-001.2

Test Date: 11/30/04
Head # : 36



HEAD DROP TEST SUMMARY
PART 572L

HEADFORM SERIAL NUMBER: 036 CALIBRATION DATE: 12-2-04		
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.98
Temperature	19° C to 26° C	22
Relative Humidity	10% to 70%	31
Peak Resultant Acceleration	225 G's to 275 G's	253.1
Peak Lateral Acceleration	15 G's Maximum	12.6
Unimodal Acceleration Curve	YES	Yes

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	**Manufacturer**	**Model Number**	**Serial Number**	**Date of Last Calibration**	**Date of Next Calibration**
	ENDEVCO	7264-2000	J35923	11-9-04	5-9-05
	ENDEVCO	7264-2000	J35916	11-9-04	5-9-05
	ENDEVCO	7264-2000	J35918	11-9-04	5-9-05

REMARKS:

RECORDED BY: _____ DATE: 12-2-04

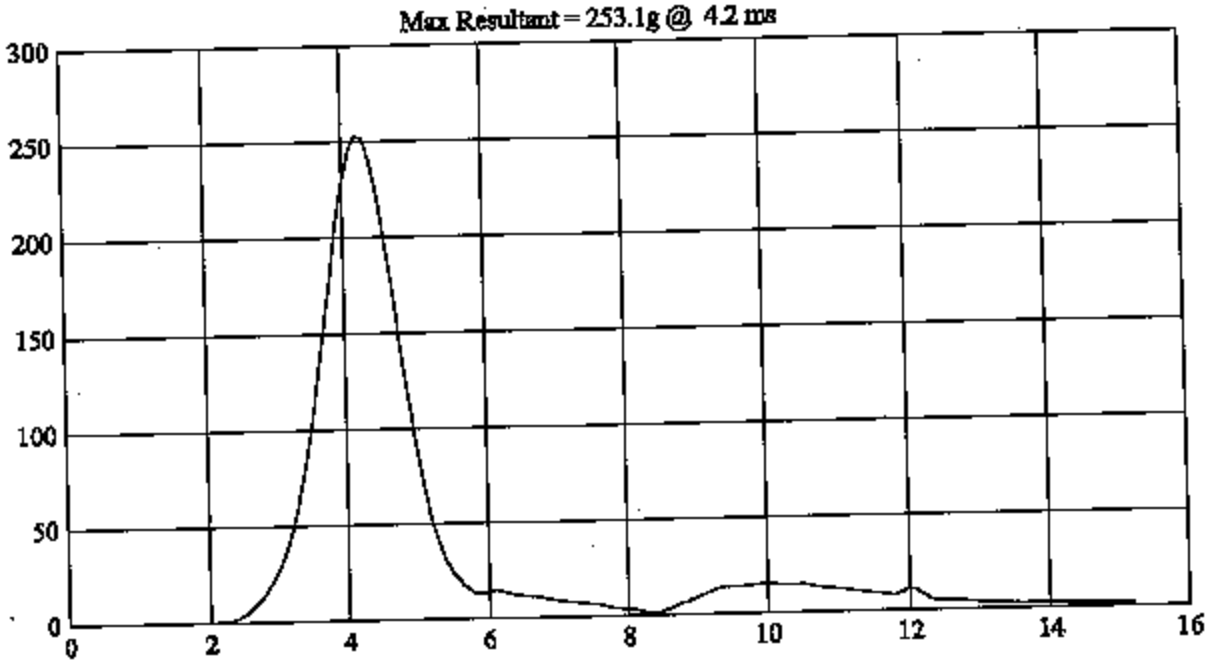
APPROVED BY: _____

Head Drop
(Preliminary Test Report)

Test Number: H36274
Test Description: Post - Test Calibration

MGA Job Number: G05I7-001.2

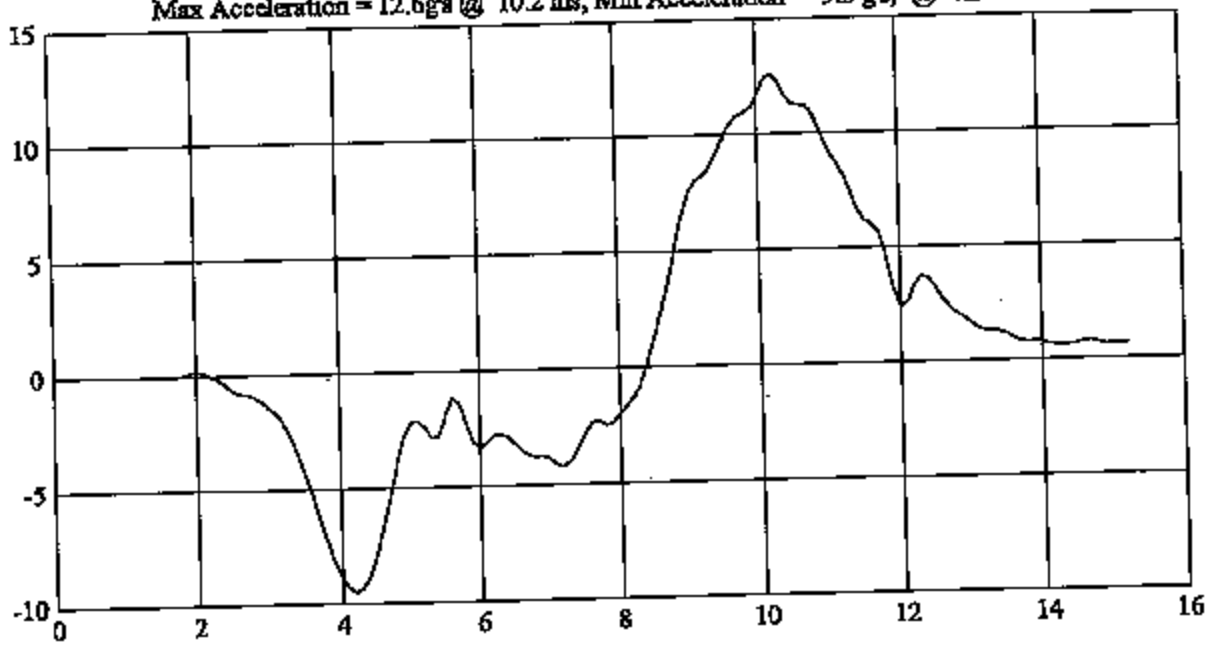
Test Date: 12/2/04
Head # : 36



Head Drop
(Preliminary Test Report)

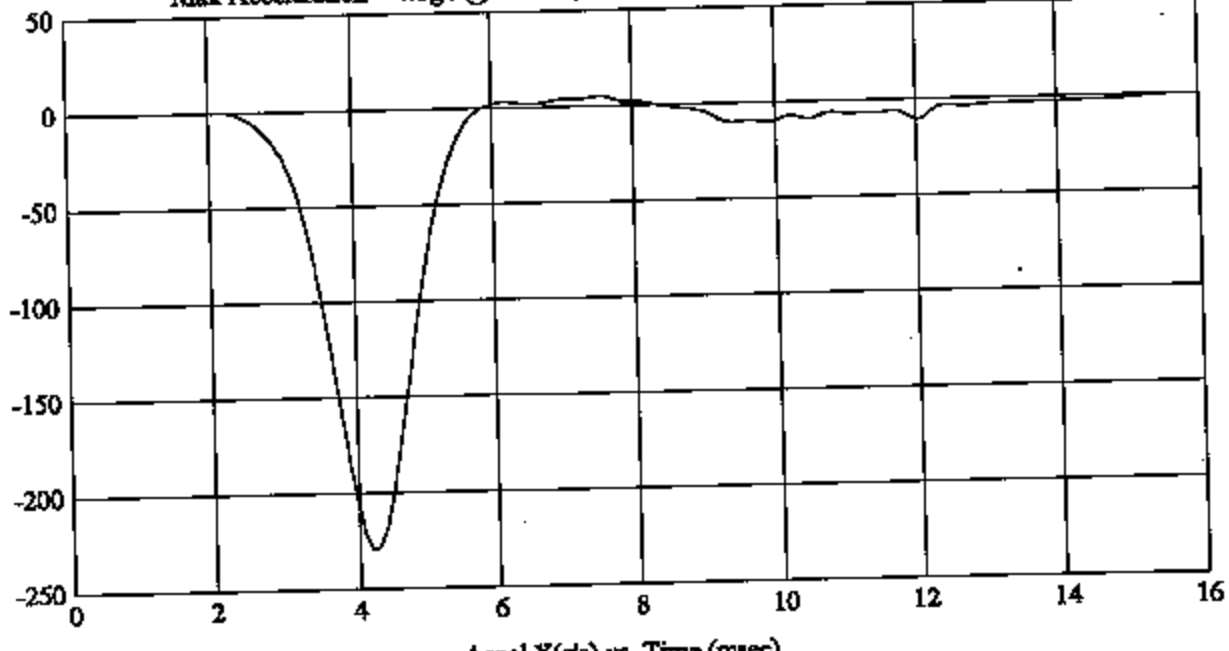
Test Number: H36274 MGA Job Number: G05I7-001.2 Test Date: 12/2/04
Test Description: Post - Test Calibration Head # : 36

Max Acceleration = 12.6g's @ 10.2 ms, Min Acceleration = -9.5 g's, @ 4.2 ms



Accel Y(g's) vs. Time (msec)

Max Acceleration = 4.8g's @ 7.5 ms, Min Acceleration = -229.7 g's, @ 4.2 ms



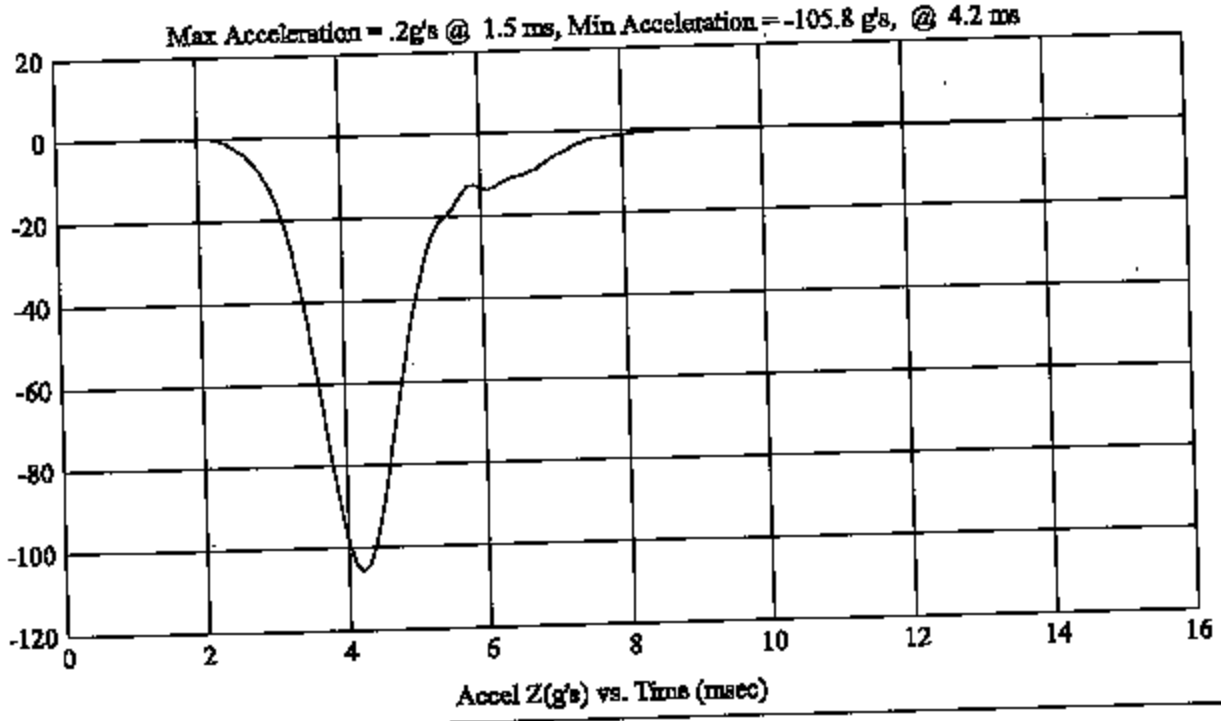
Accel X(g's) vs. Time (msec)

Head Drop
(Preliminary Test Report)

Test Number: H36274
Test Description: Post - Test Calibration

MGA Job Number: G05I7-001.2

Test Date: 12/2/04
Head # : 36



HEAD DROP TEST SUMMARY
PART 572L

HEADFORM SERIAL NUMBER: 037	CALIBRATION DATE: 11-30-04	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.96
Temperature	19° C to 26° C	22
Relative Humidity	10% to 70%	30
Peak Resultant Acceleration	225 G's to 275 G's	260.3
Peak Lateral Acceleration	15 G's Maximum	11.5
Unimodal Acceleration Curve	YES	Yes

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	**Manufacturer**	**Model Number**	**Serial Number**	**Date of Last Calibration**	**Date of Next Calibration**
1	ENDEVCO	7264-2000	J35800	11-9-04	5-9-05
2	ENDEVCO	7264-2000	J35841	11-9-04	5-9-05
3	ENDEVCO	7264-2000	J35791	11-9-04	5-9-05

REMARKS:

RECORDED BY: _____ **DATE:** 11-30-04

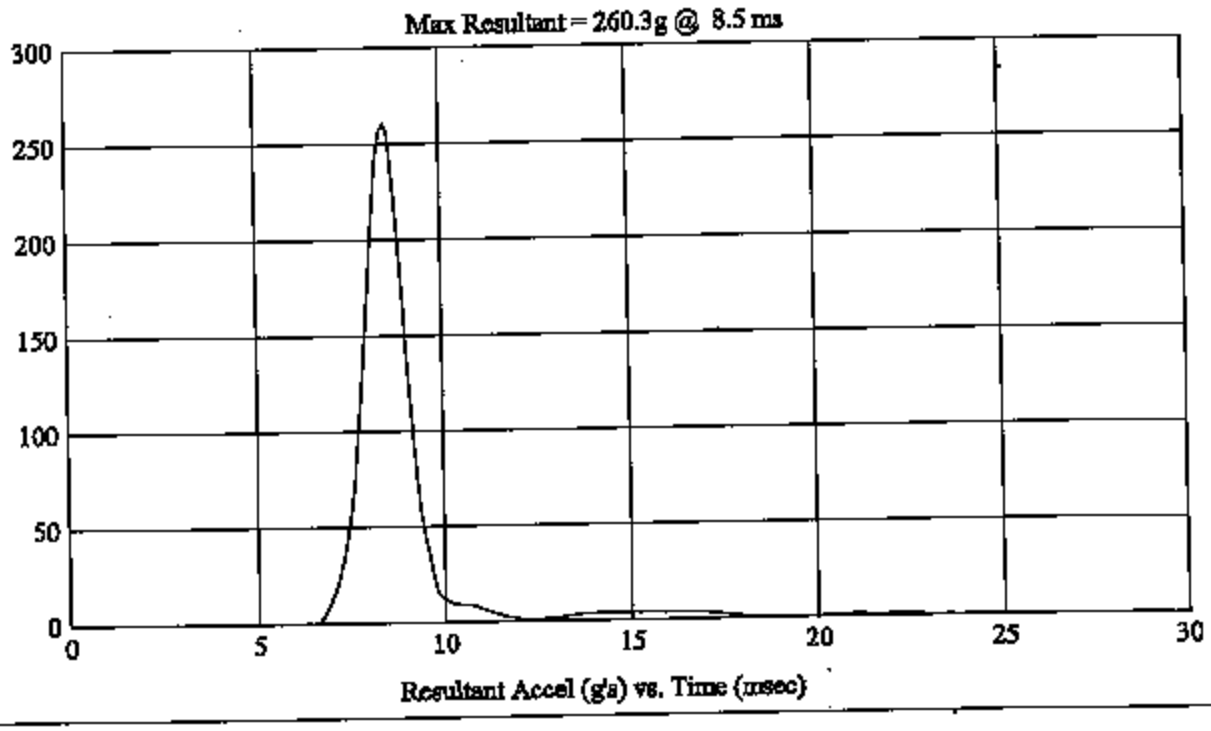
APPROVED BY: _____

Head Drop
(Preliminary Test Report)

Test Number: H37146
Test Description: Pre - Test Calibration

MGA Job Number: G04I7-001.2

Test Date: 11/30/04
Head # : 37



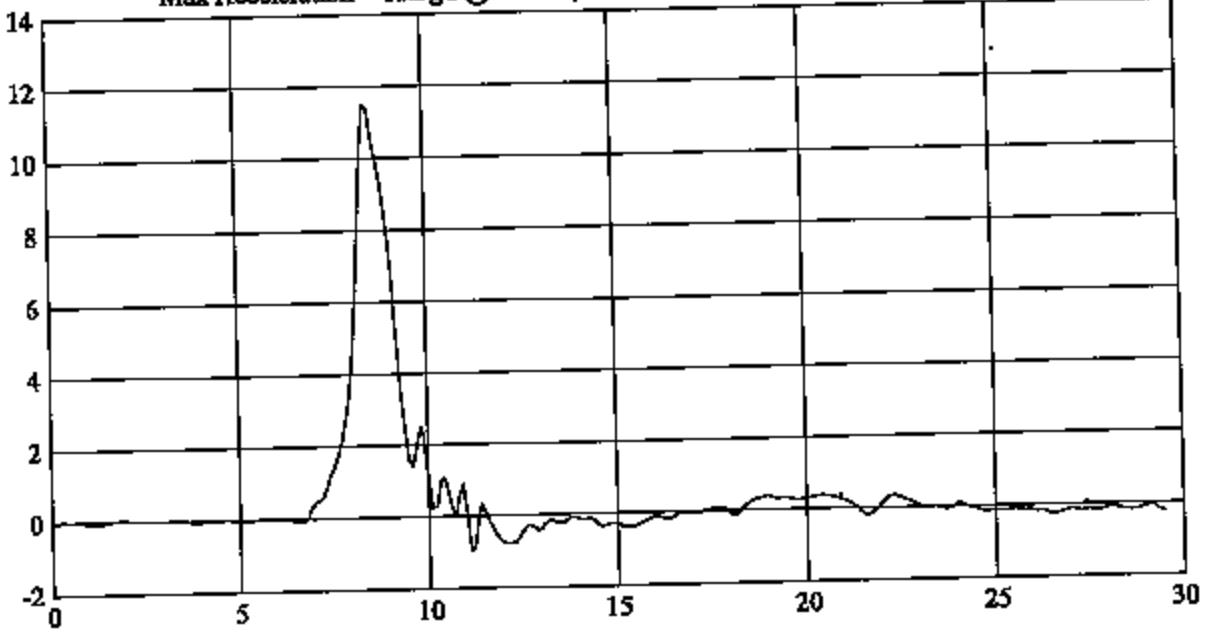
Head Drop
(Preliminary Test Report)

Test Number: H37146
Test Description: Pre - Test Calibration

MGA Job Number: G04I7-001.2

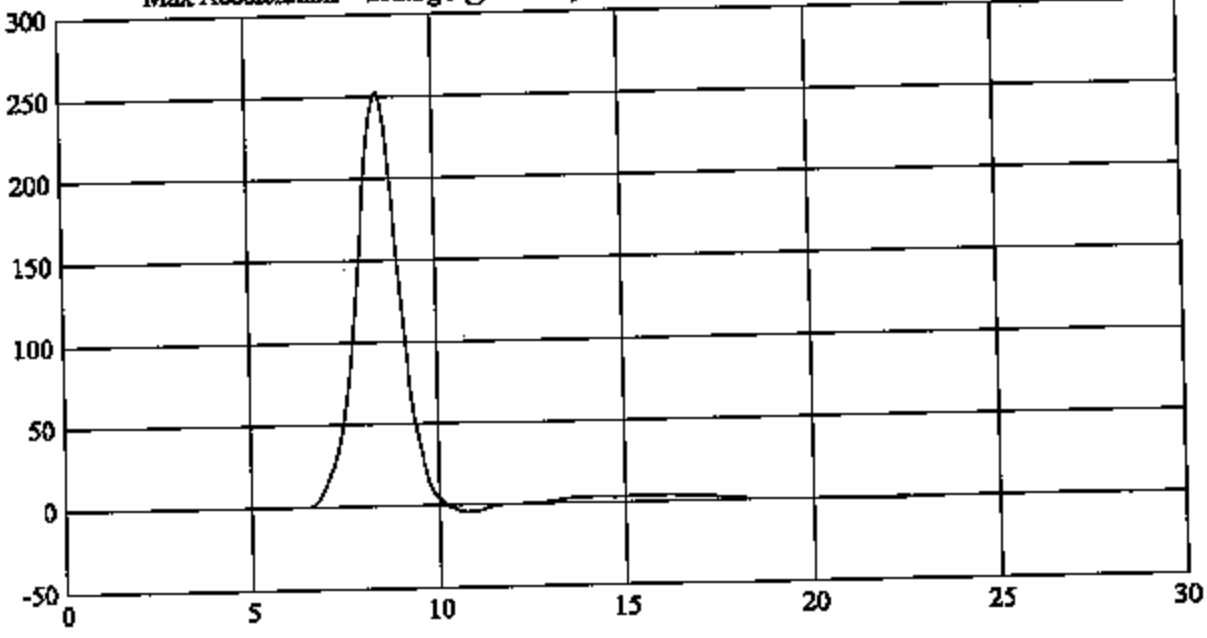
Test Date: 11/30/04
Head # : 37

Max Acceleration = 11.5g's @ 8.4 ms, Min Acceleration = -1 g's, @ 11.1 ms



Accel Y(g's) vs. Time (msec)

Max Acceleration = 252.5g's @ 8.5 ms, Min Acceleration = -4.2 g's, @ 10.7 ms



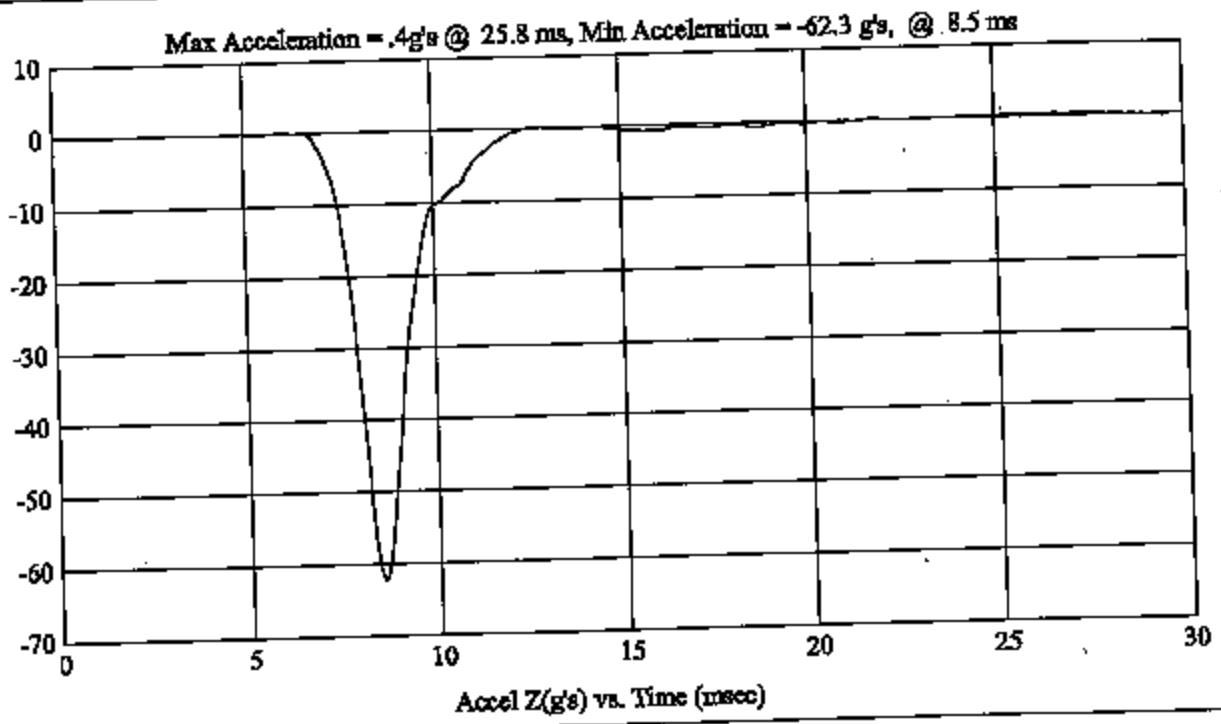
Accel X(g's) vs. Time (msec)

Head Drop
(Preliminary Test Report)

Test Number: H37146
Test Description: Pre - Test Calibration

MGA Job Number: G04I7-001.2

Test Date: 11/30/04
Head # : 37



HEAD DROP TEST SUMMARY
PART 572L

HEADFORM SERIAL NUMBER: 037 CALIBRATION DATE: 12-2-04

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	9.96
Temperature	19° C to 26° C	22
Relative Humidity	10% to 70%	31
Peak Resultant Acceleration	225 G's to 275 G's	254.4 ~~253.1~~
Peak Lateral Acceleration	15 G's Maximum	7.5
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	**Manufacturer**	**Model Number**	**Serial Number**	**Date of Last Calibration**	**Date of Next Calibration**
1	ENDEVCO	7264-2000	J35800	11-9-04	5-9-05
2	ENDEVCO	7264-2000	J35841	11-9-04	5-9-05
3	ENDEVCO	7264-2000	J35791	11-9-04	5-9-05

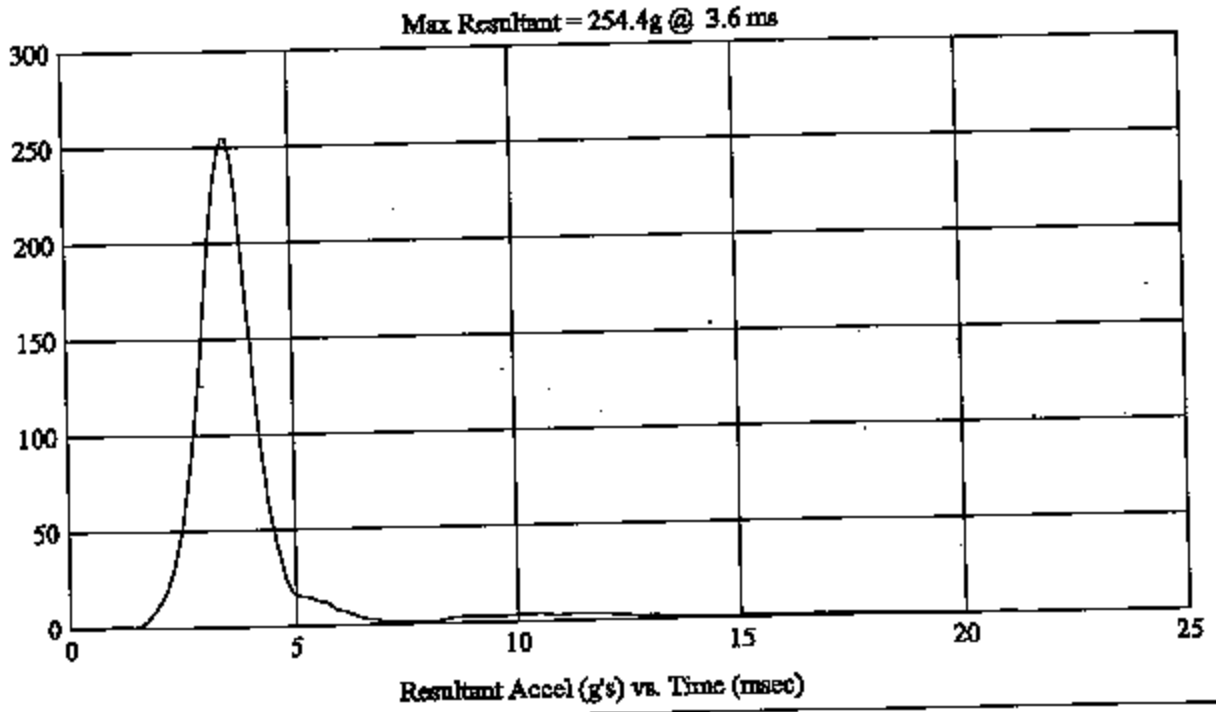
REMARKS:

RECORDED BY: _____ DATE: 12-2-04

APPROVED BY: _____

Head Drop
(Preliminary Test Report)

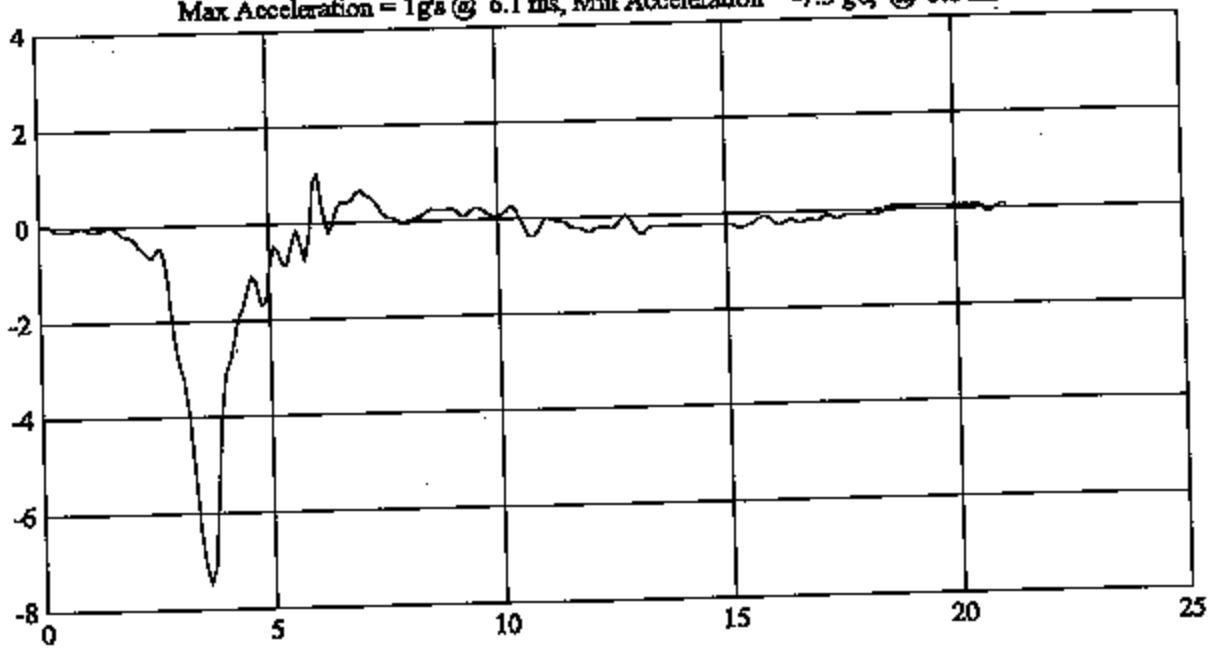
Test Number: H37147 MGA Job Number: G0517-001.2 Test Date: 12/2/04
Test Description: Post - Test Calibration Head # : 37



Head Drop
(Preliminary Test Report)

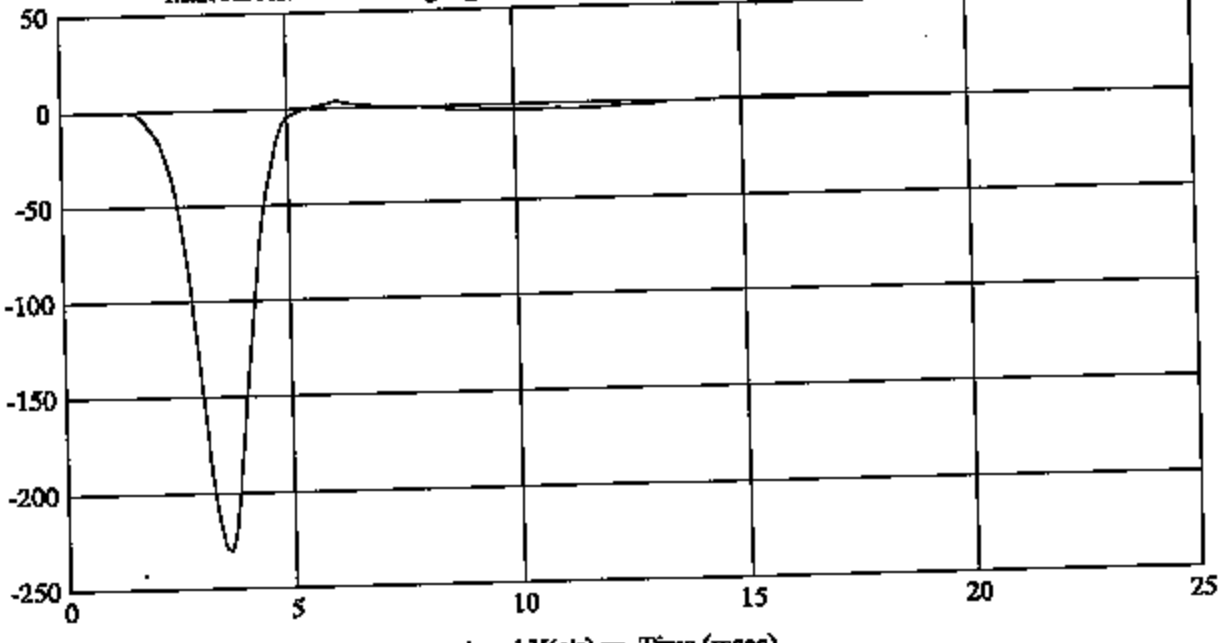
Test Number: H37147 MGA Job Number: G05I7-001.2 Test Date: 12/2/04
Test Description: Post - Test Calibration Head # : 37

Max Acceleration = 1g's @ 6.1 ms, Min Acceleration = -7.5 g's, @ 3.6 ms



Accel Y(g's) vs. Time (msec)

Max Acceleration = 3.4g's @ 6.1 ms, Min Acceleration = -230.2 g's, @ 3.6 ms

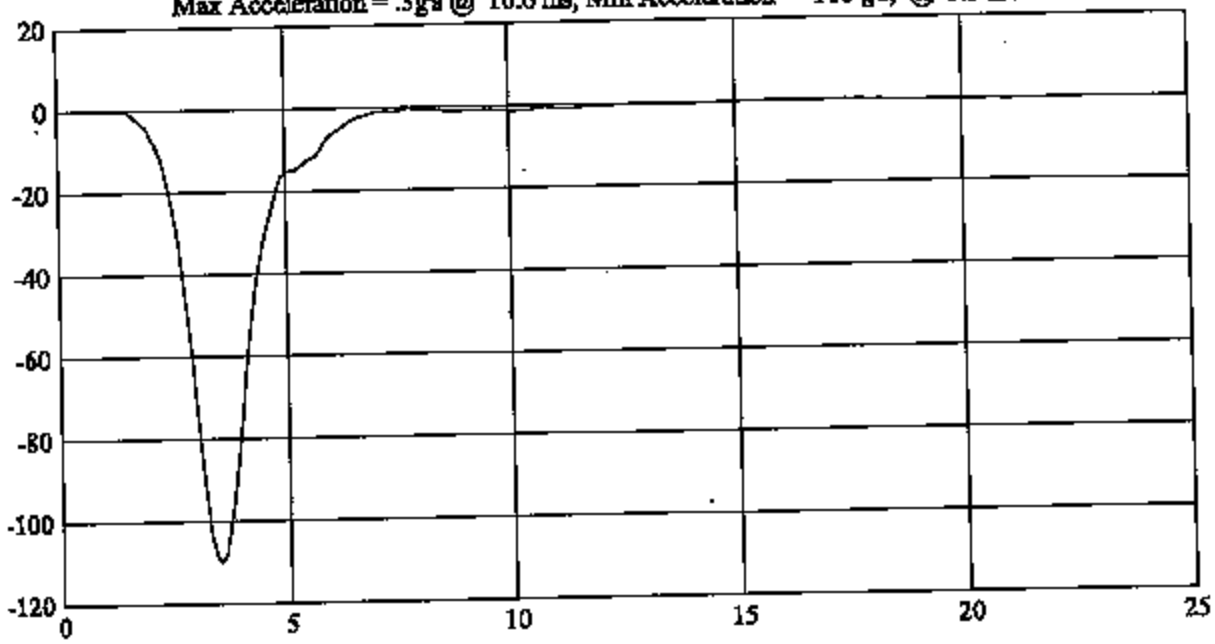


Accel X(g's) vs. Time (msec)

Head Drop
(Preliminary Test Report)

Test Number: H37147 MGA Job Number: G05I7-001.2 Test Date: 12/2/04
Test Description: Post - Test Calibration Head # : 37

Max Acceleration = .3g's @ 16.6 ms, Min Acceleration = -110 g's, @ 3.5 ms



Accel Z(g's) vs. Time (msec)

HEAD DROP TEST SUMMARY
PART 572L

HEADFORM SERIAL NUMBER: 038 CALIBRATION DATE: 11-30-04

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	9.92
Temperature	19° C to 26° C	22
Relative Humidity	10% to 70%	30
Peak Resultant Acceleration	225 G's to 275 G's	250.1
Peak Lateral Acceleration	15 G's Maximum	5.9
Unimodal Acceleration Curve	YES	Yes

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	**Manufacturer**	**Model Number**	**Serial Number**	**Date of Last Calibration**	**Date of Next Calibration**
1	ENDEVCO	7264-2000	J36197	11-9-04	5-9-05
2	ENDEVCO	7264-2000	J36193	11-9-04	5-9-05
3	ENDEVCO	7264-2000	J36353	11-9-04	5-9-05

REMARKS:

RECORDED BY: _____ DATE: 11-30-04

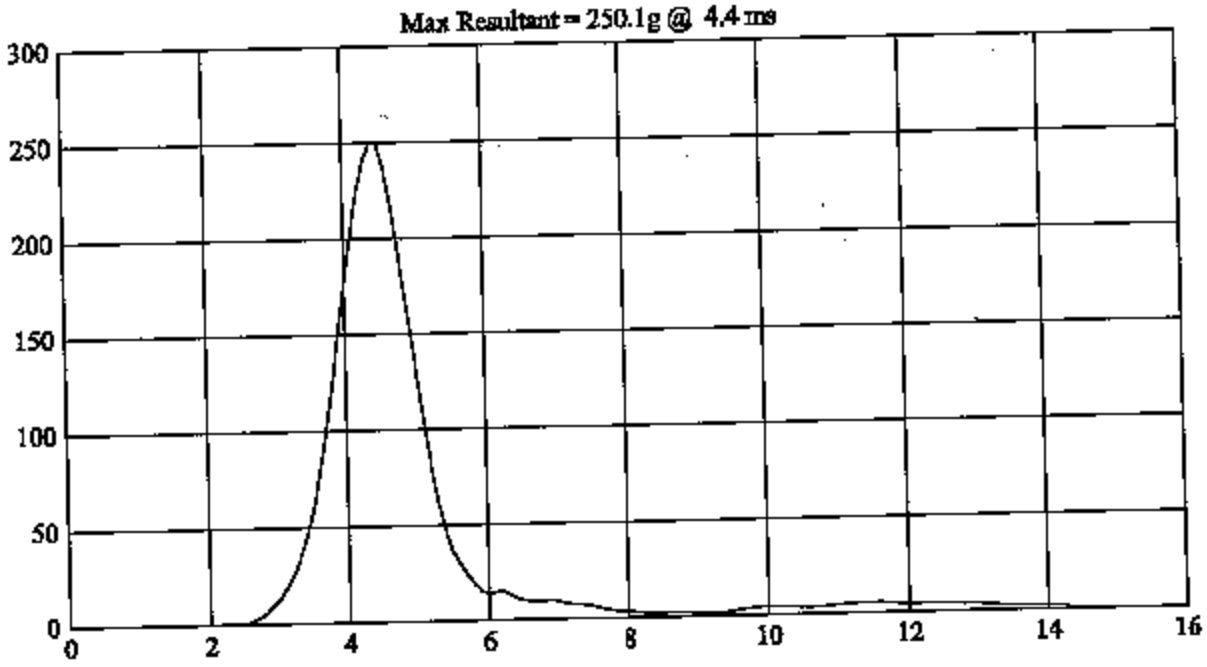
APPROVED BY: _____

Head Drop
(Preliminary Test Report)

Test Number: H38256
Test Description: Pre - Test Calibration

MGA Job Number: G04I7-001.2

Test Date: 11/30/04
Head # : 38



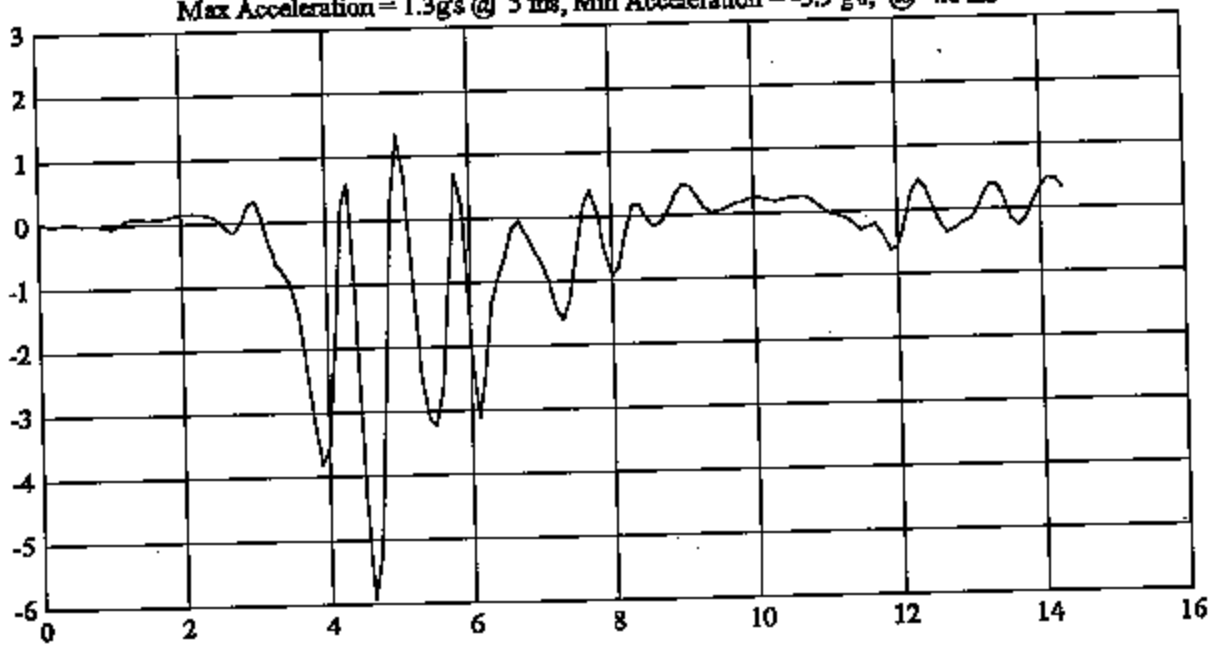
Head Drop
(Preliminary Test Report)

Test Number: H38256
Test Description: Pre - Test Calibration

MGA Job Number: G04I7-001.2

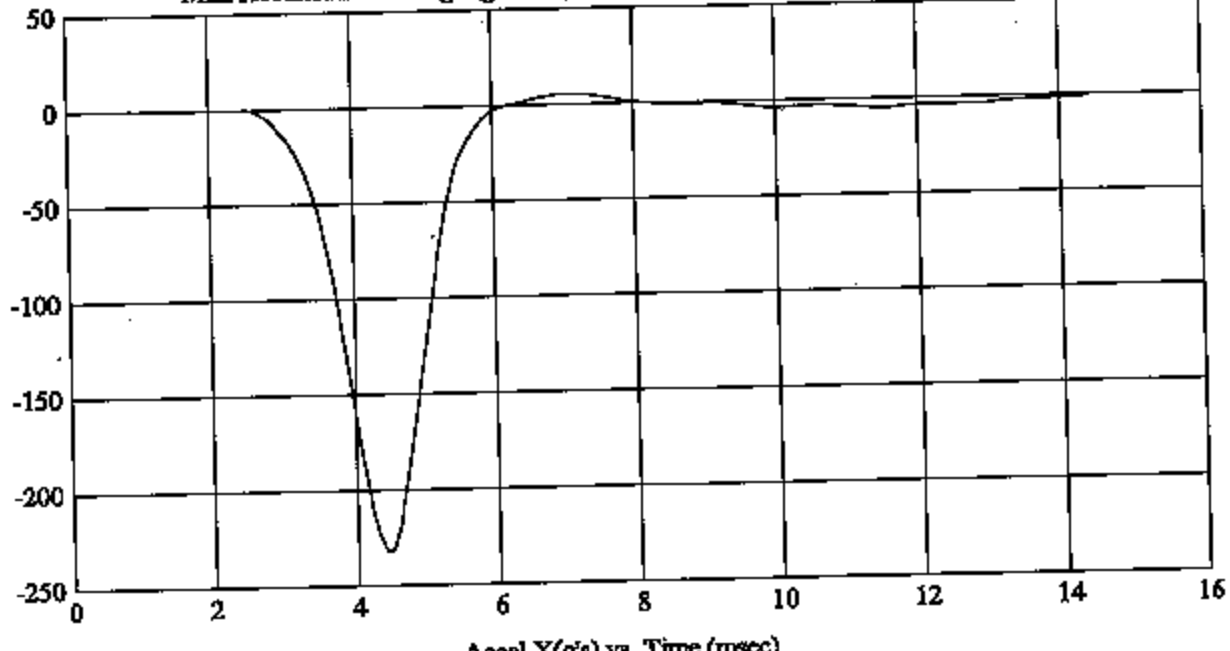
Test Date: 11/30/04
Head # : 38

Max Acceleration = 1.3g's @ 5 ms, Min Acceleration = -5.9 g's, @ 4.6 ms



Accel Y(g's) vs. Time (msec)

Max Acceleration = 5.3g's @ 7 ms, Min Acceleration = -232.3 g's, @ 4.4 ms



Accel X(g's) vs. Time (msec)

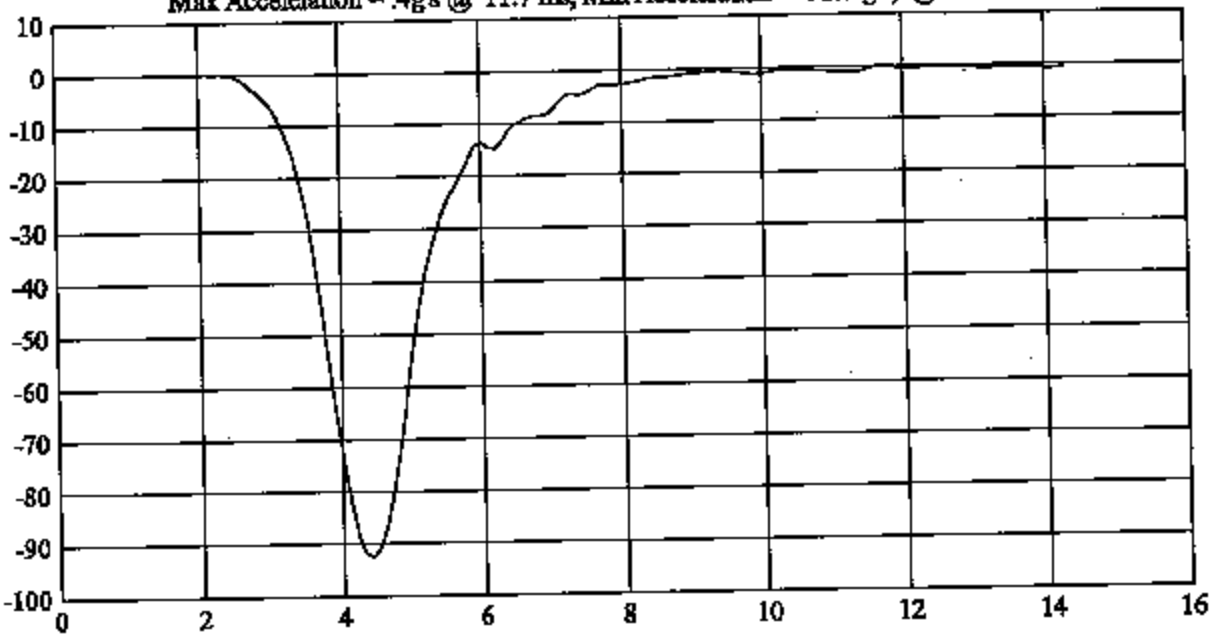
Head Drop
(Preliminary Test Report)

Test Number: H38256
Test Description: Pre - Test Calibration

MGA Job Number: G04I7-001.2

Test Date: 11/30/04
Head # : 38

Max Acceleration = .4g's @ 11.7 ms, Min Acceleration = -92.7 g's, @ 4.4 ms



Accel Z(g's) vs. Time (msec)

HEAD DROP TEST SUMMARY
PART 572L

HEADFORM SERIAL NUMBER: 036	CALIBRATION DATE: 12-2-04	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.92
Temperature	19° C to 26° C	22
Relative Humidity	10% to 70%	31
Peak Resultant Acceleration	225 G's to 275 G's	242.1
Peak Lateral Acceleration	15 G's Maximum	6.3
Unimodal Acceleration Curve	YES	Yes

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	**Manufacturer**	**Model Number**	**Serial Number**	**Date of Last Calibration**	**Date of Next Calibration**
1	ENDEVCO	7264-2000	536197	11-9-04	5-9-05
2	ENDEVCO	7264-2000	536193	11-9-04	5-9-05
3	ENDEVCO	7264-2000	536353	11-9-04	5-9-05

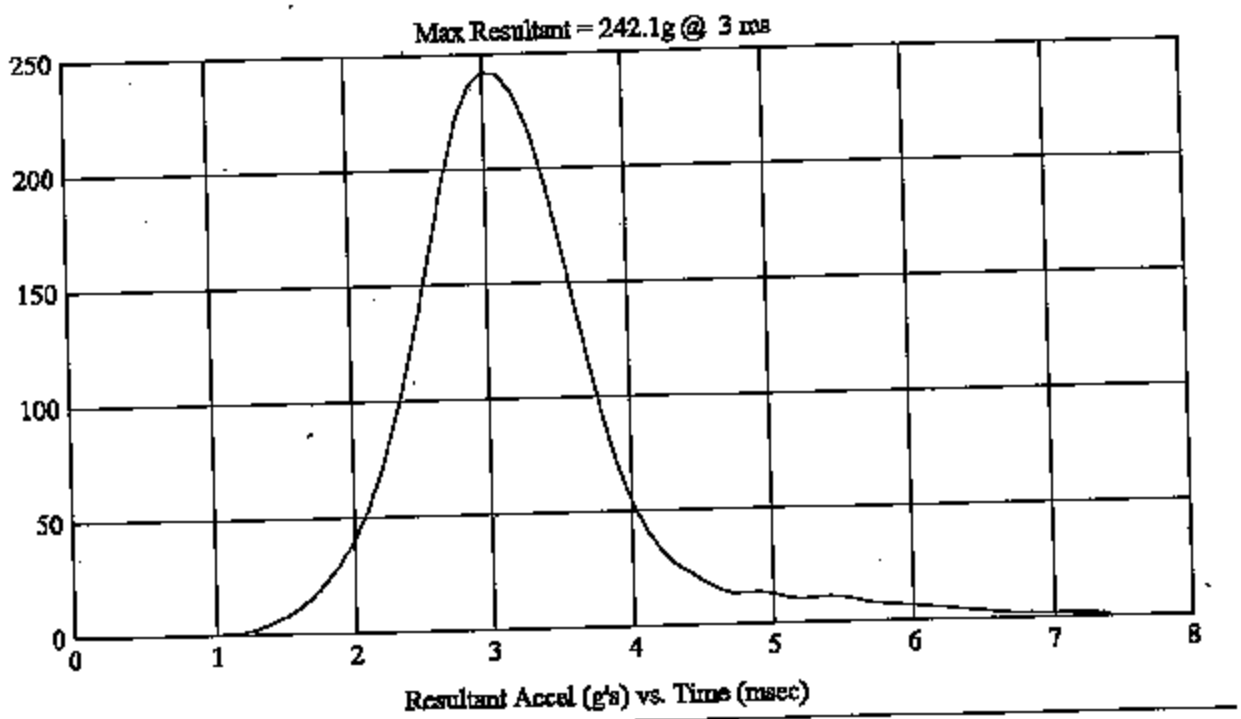
REMARKS:

RECORDED BY: _____ DATE: 12-2-04

APPROVED BY: _____

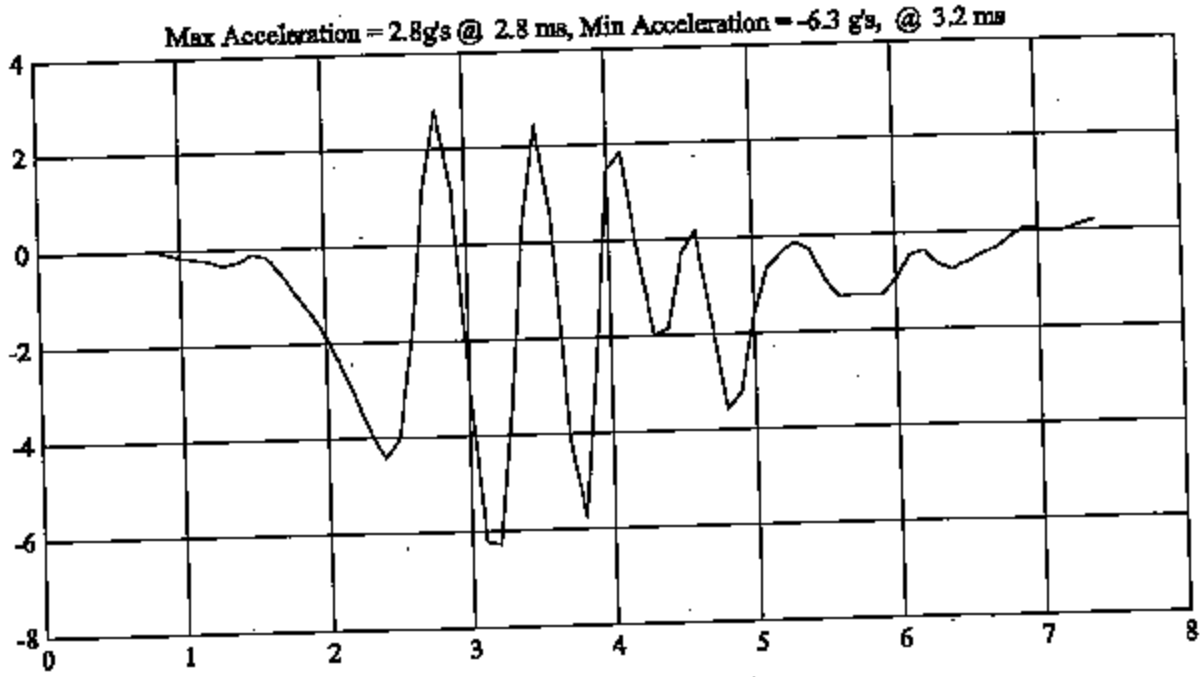
Head Drop
(Preliminary Test Report)

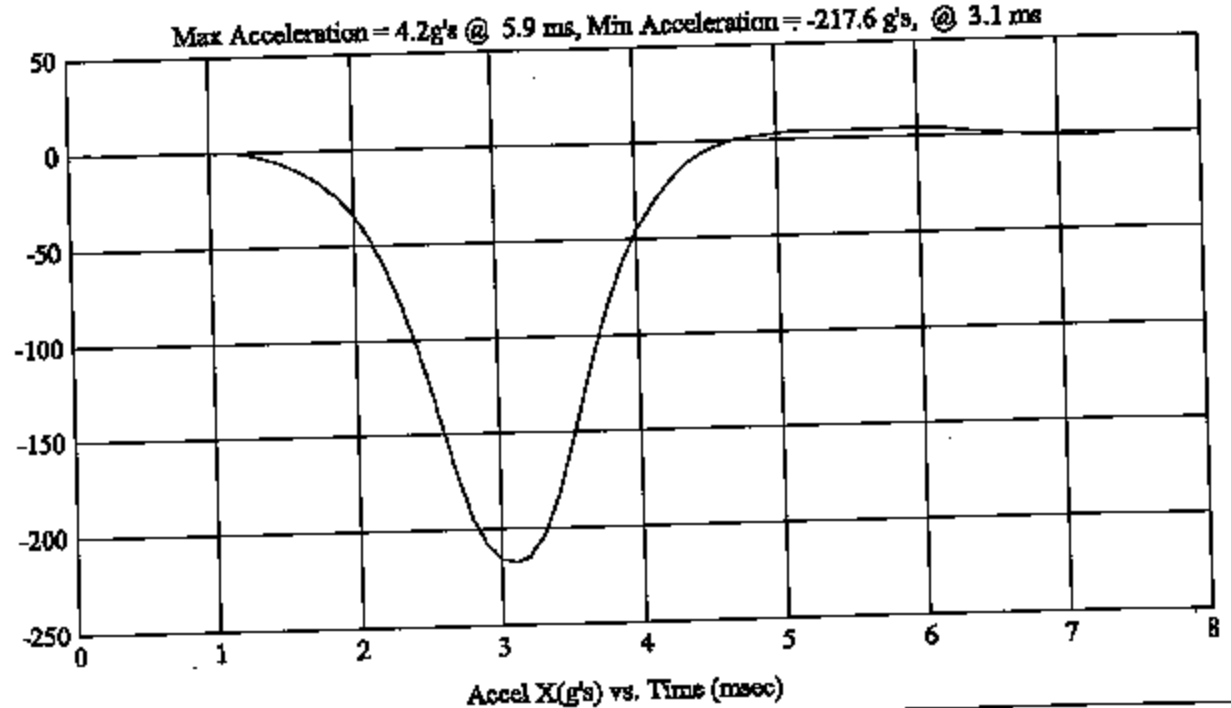
Test Number: H38257 MGA Job Number: G05I7-001.2 Test Date: 12/2/04
Test Description: Post - Test Calibration Head # : 38



Head Drop
(Preliminary Test Report)

Test Number: H38257 MGA Job Number: G05I7-001.2 Test Date: 12/2/04
Test Description: Post - Test Calibration Head # : 38



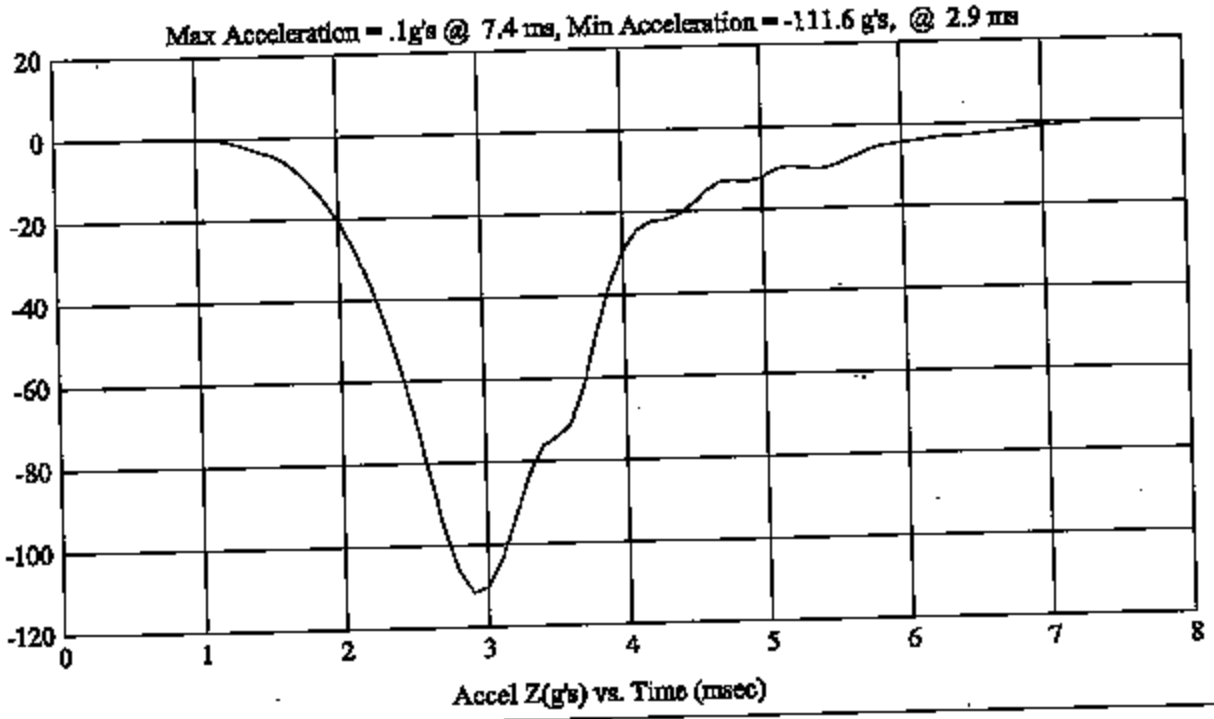


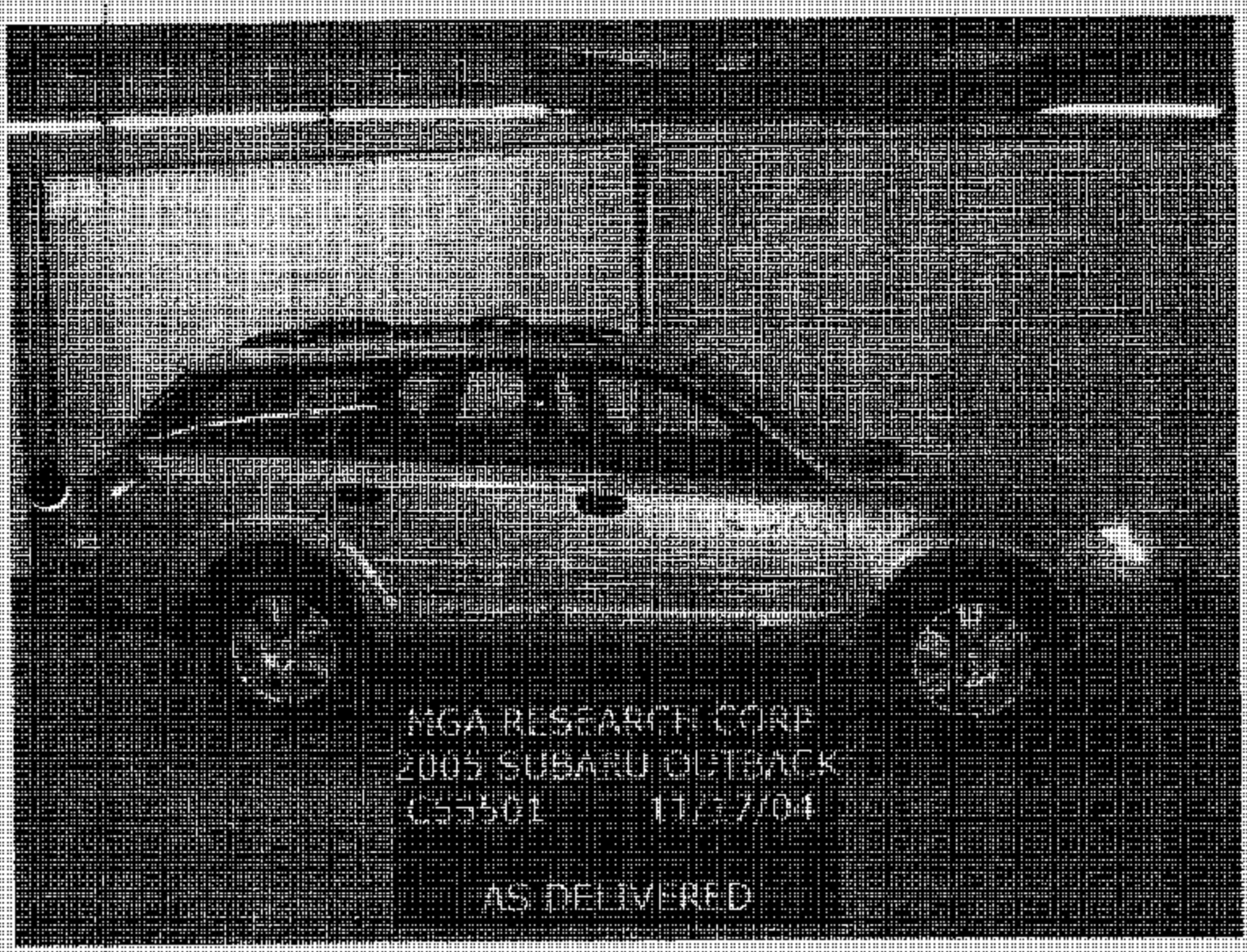
Head Drop
(Preliminary Test Report)

Test Number: H38257
Test Description: Post - Test Calibration

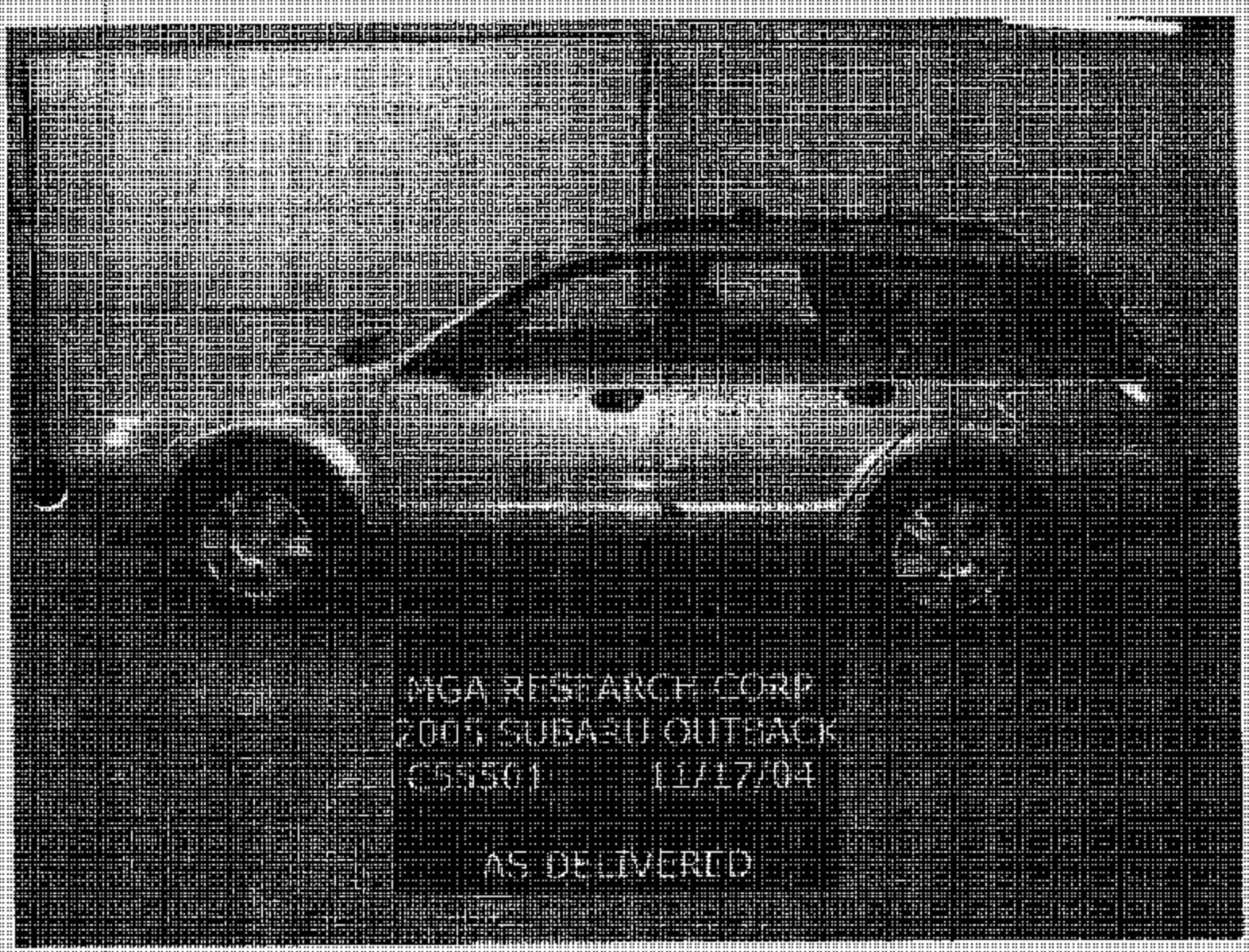
MGA Job Number: G05I7-001.2

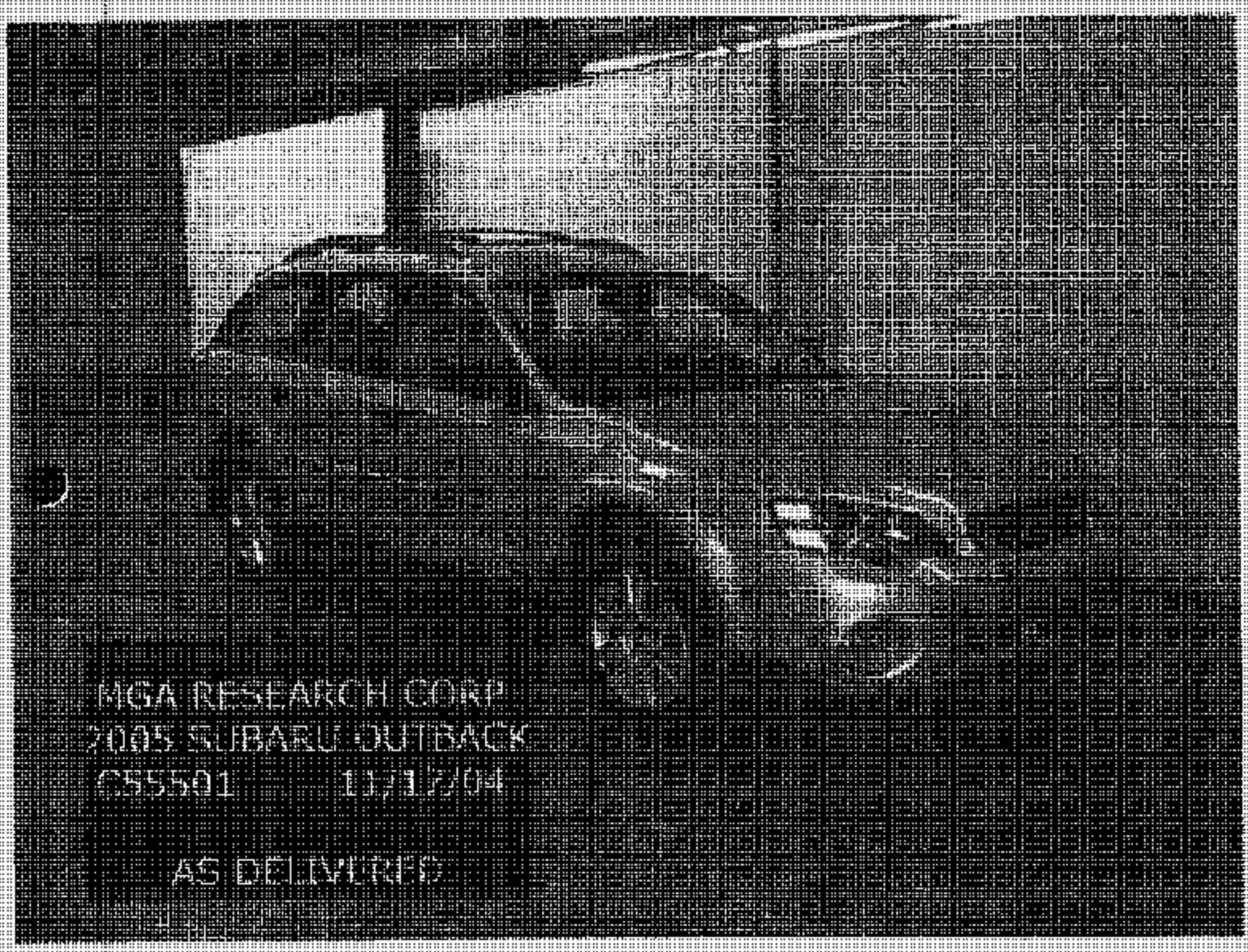
Test Date: 12/2/04
Head # : 38

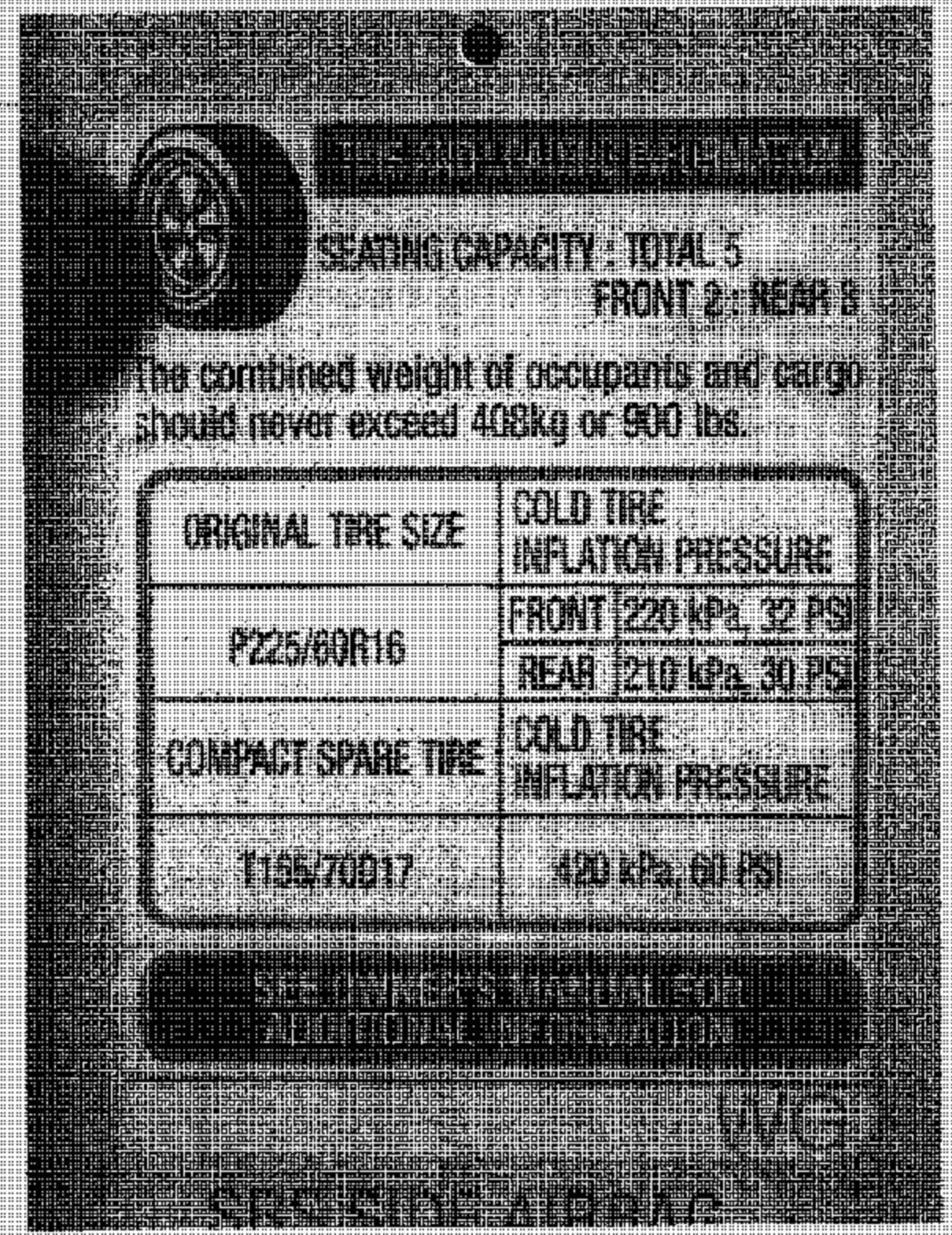


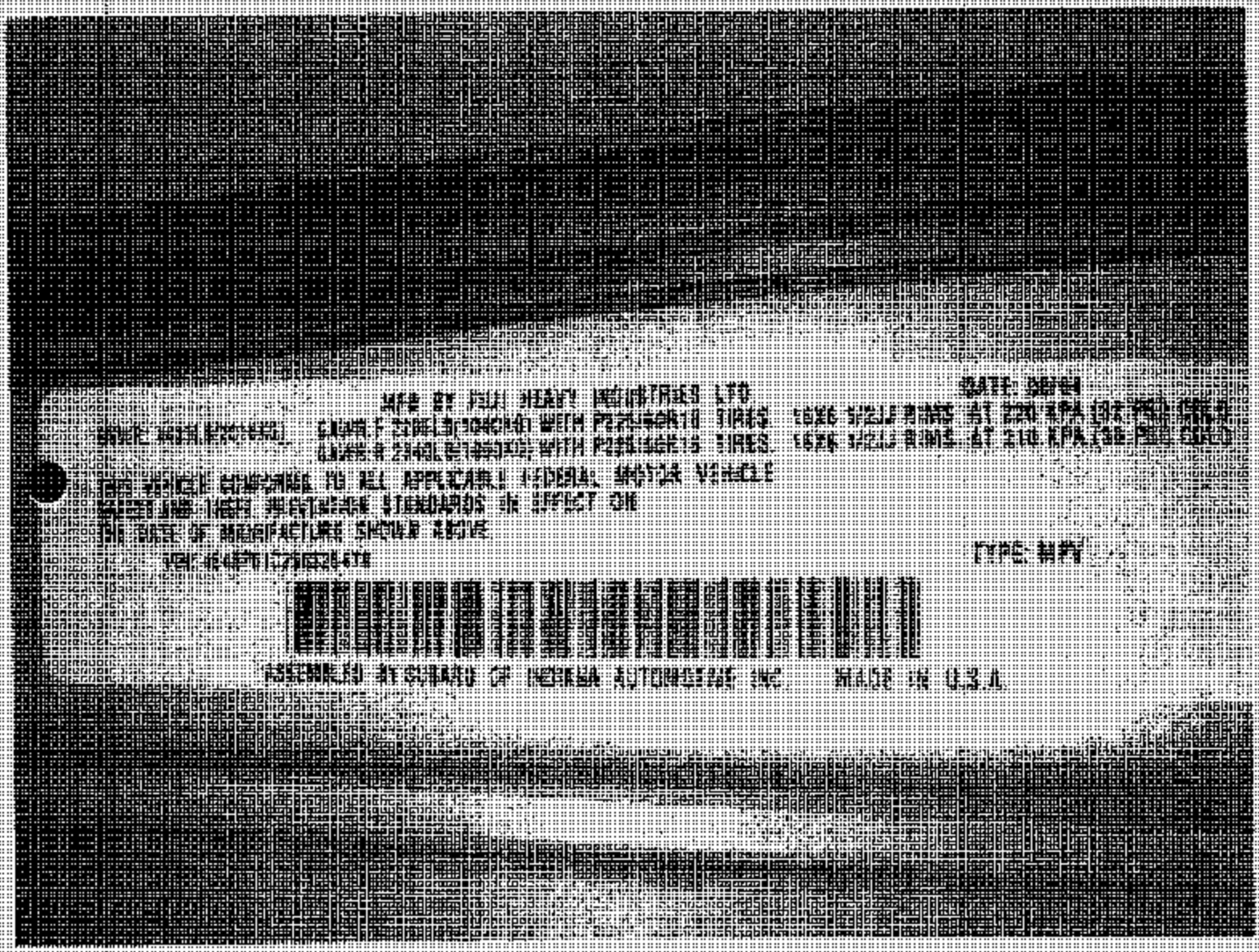

MGA RESEARCH CORP
2005 SUBARU OUTBACK
C53501 11/2/04
AS DELIVERED

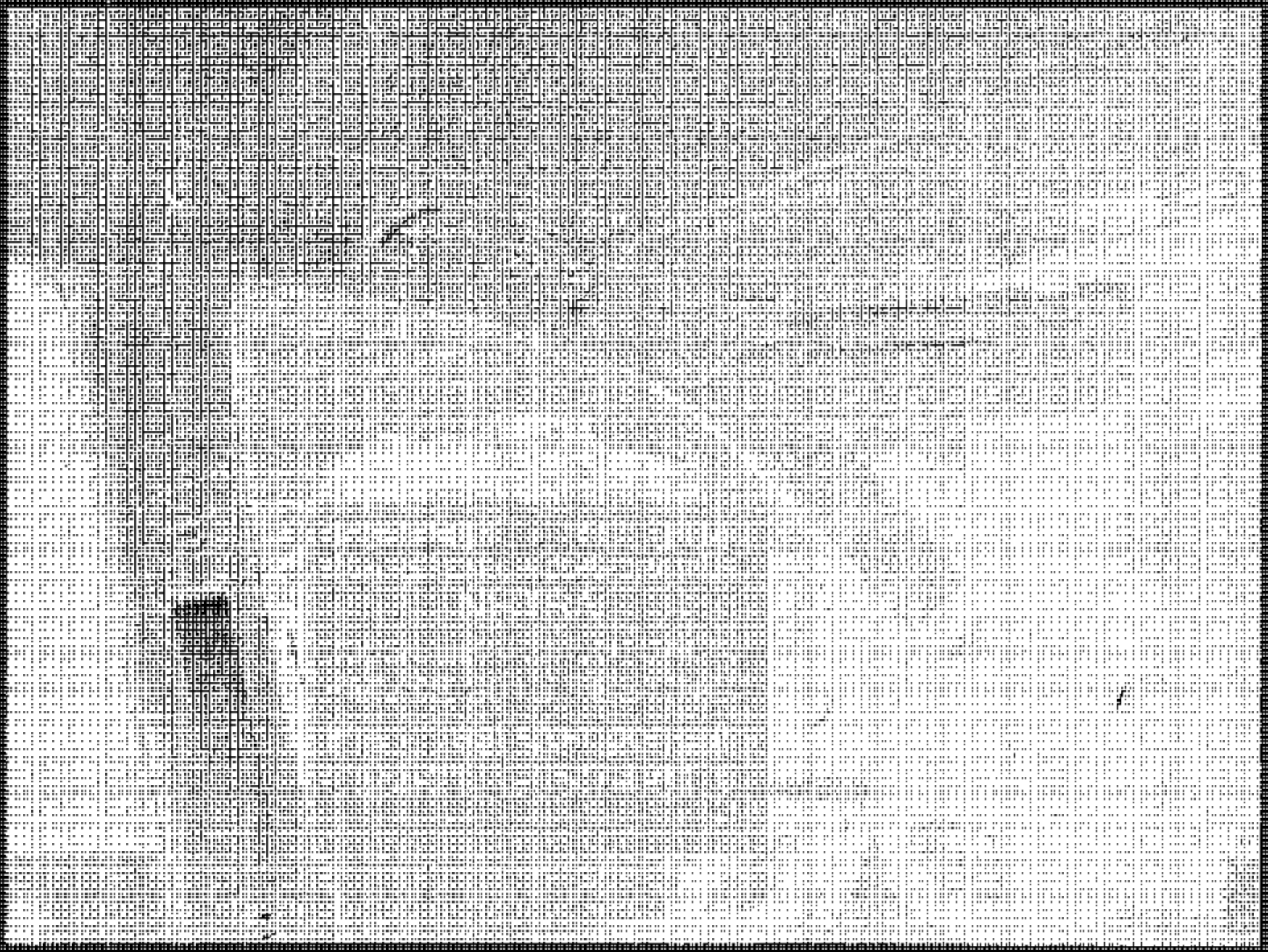

MGA RESEARCH CORP
2005 SUBARU OUTBACK
C55501 11/17/04
AS DELIVERED

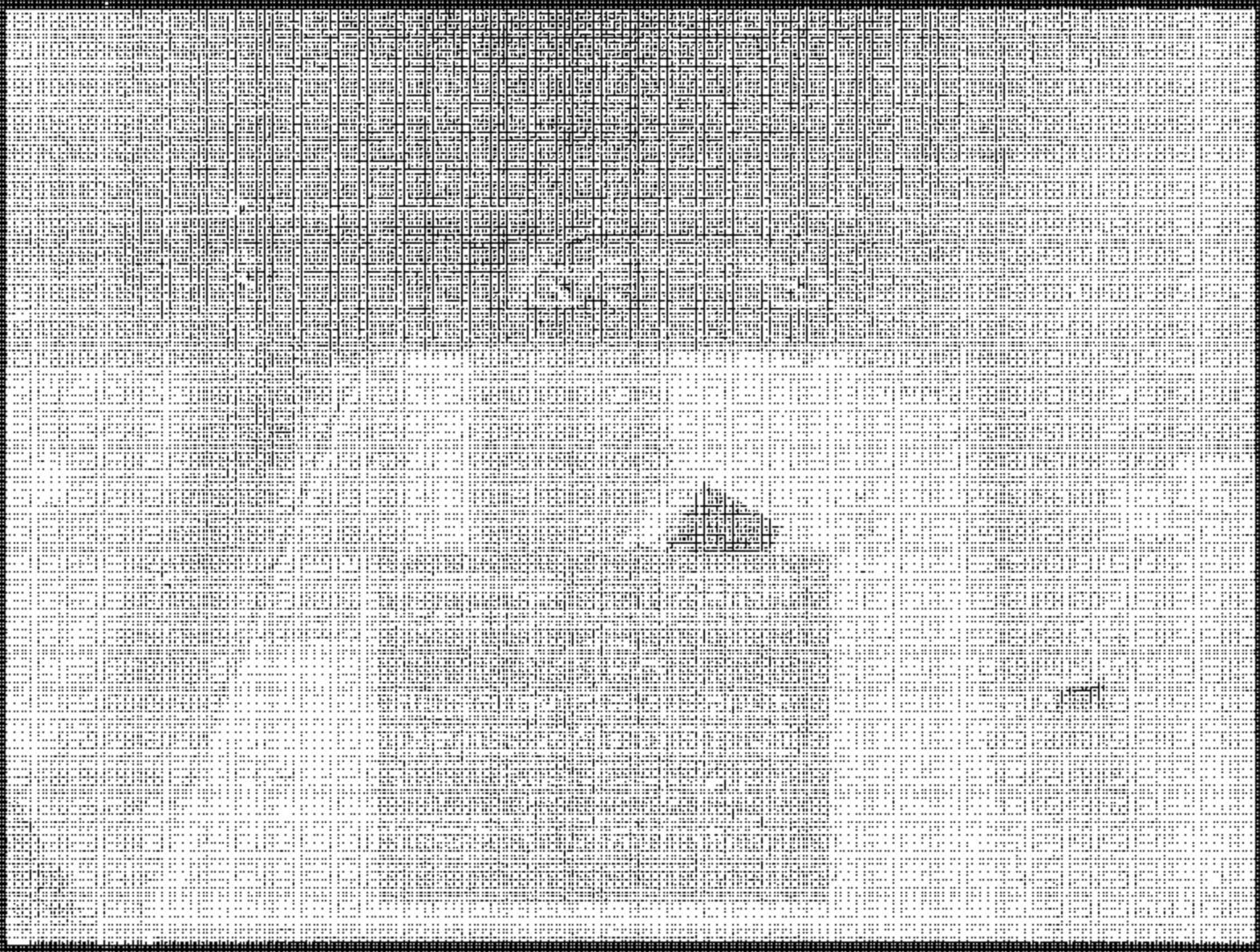

MGA RESEARCH CORP
2005 SUBARU OUTBACK
CS1501 11/17/04
AS DELIVERED

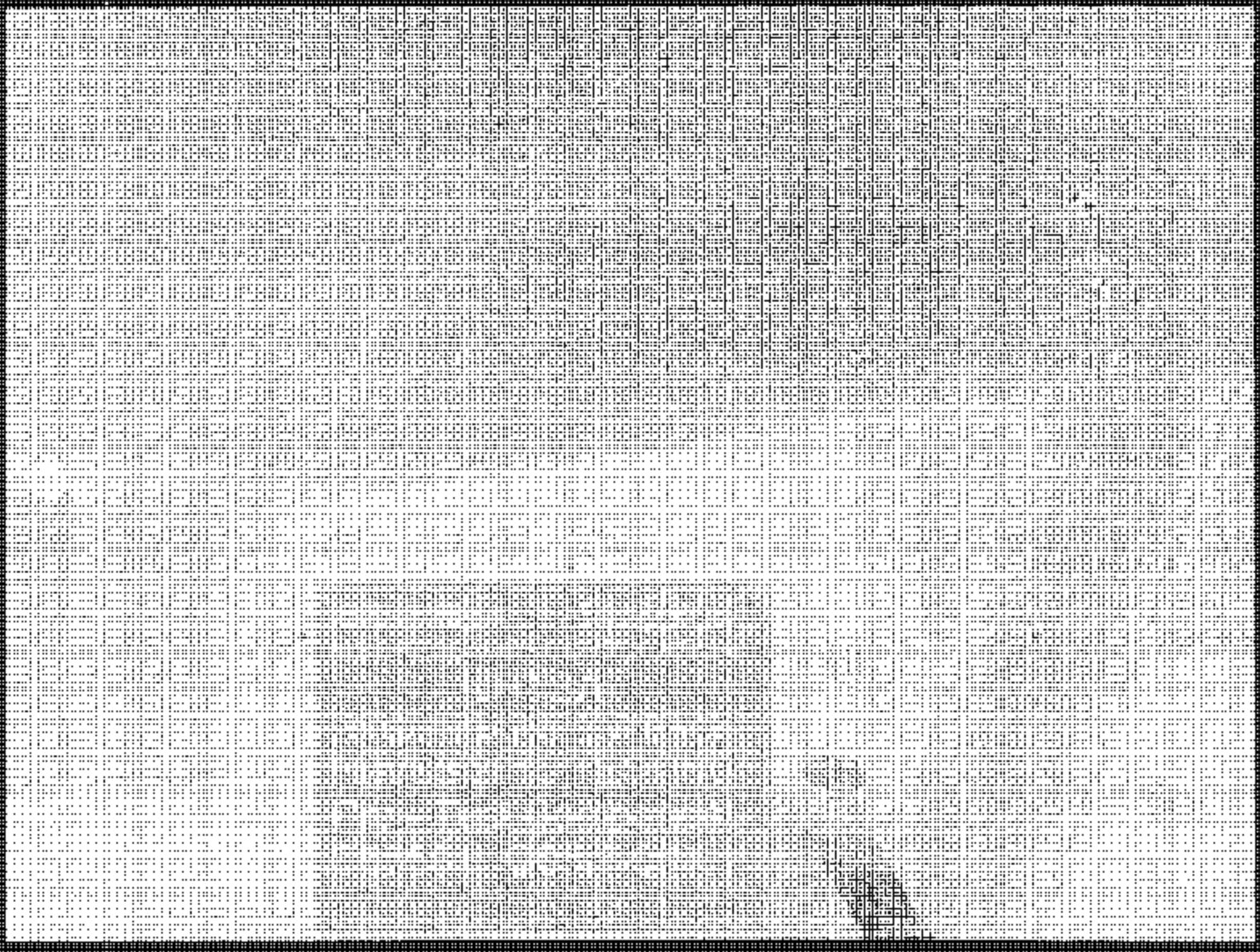

MGA RESEARCH CORP
2005 SUBARU OUTBACK
C555Q1 11/12/04
AS DELIVERED

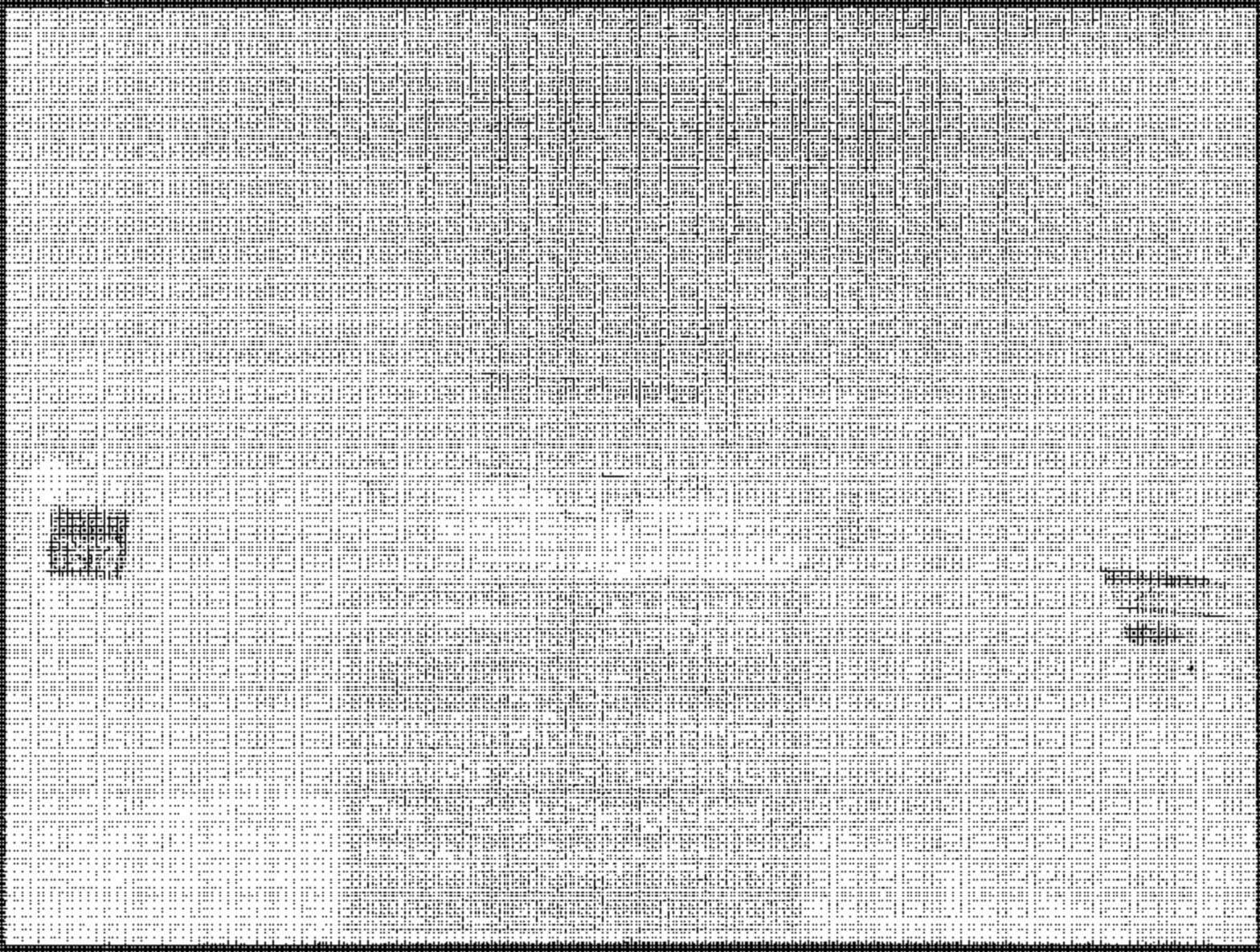

SEATING CAPACITY : TOTAL 5
FRONT 2 : REAR 3
The combined weight of occupants and cargo should never exceed 408kg or 900 lbs.
ORIGINAL TIRE SIZE
COLD TIRE INFLATION PRESSURE
P225/60R16
FRONT 220 kPa, 32 PSI
REAR 210 kPa, 30 PSI
COMPACT SPARE TIRE
COLD TIRE INFLATION PRESSURE
T135/70D17
420 kPa, 61 PSI



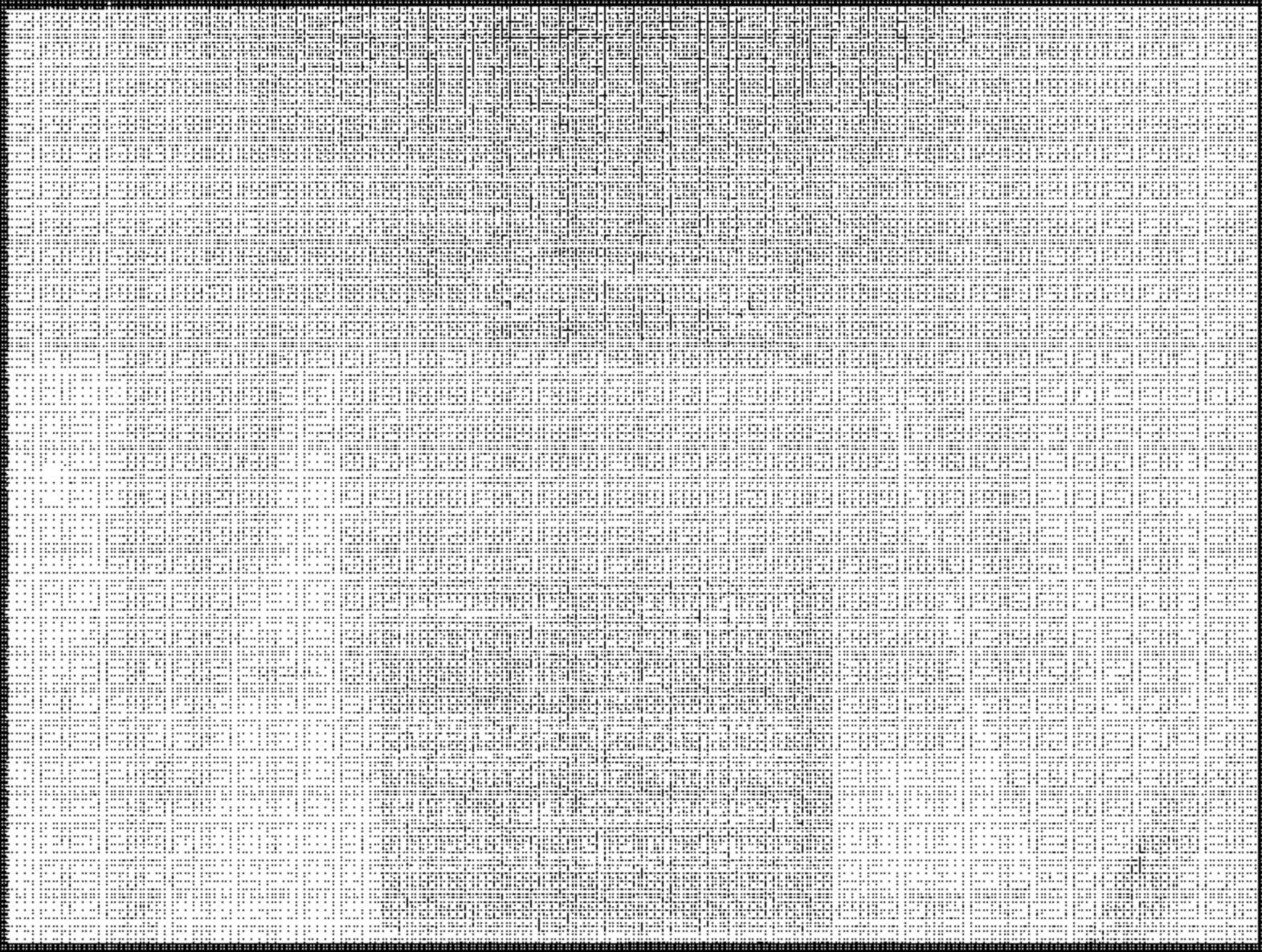


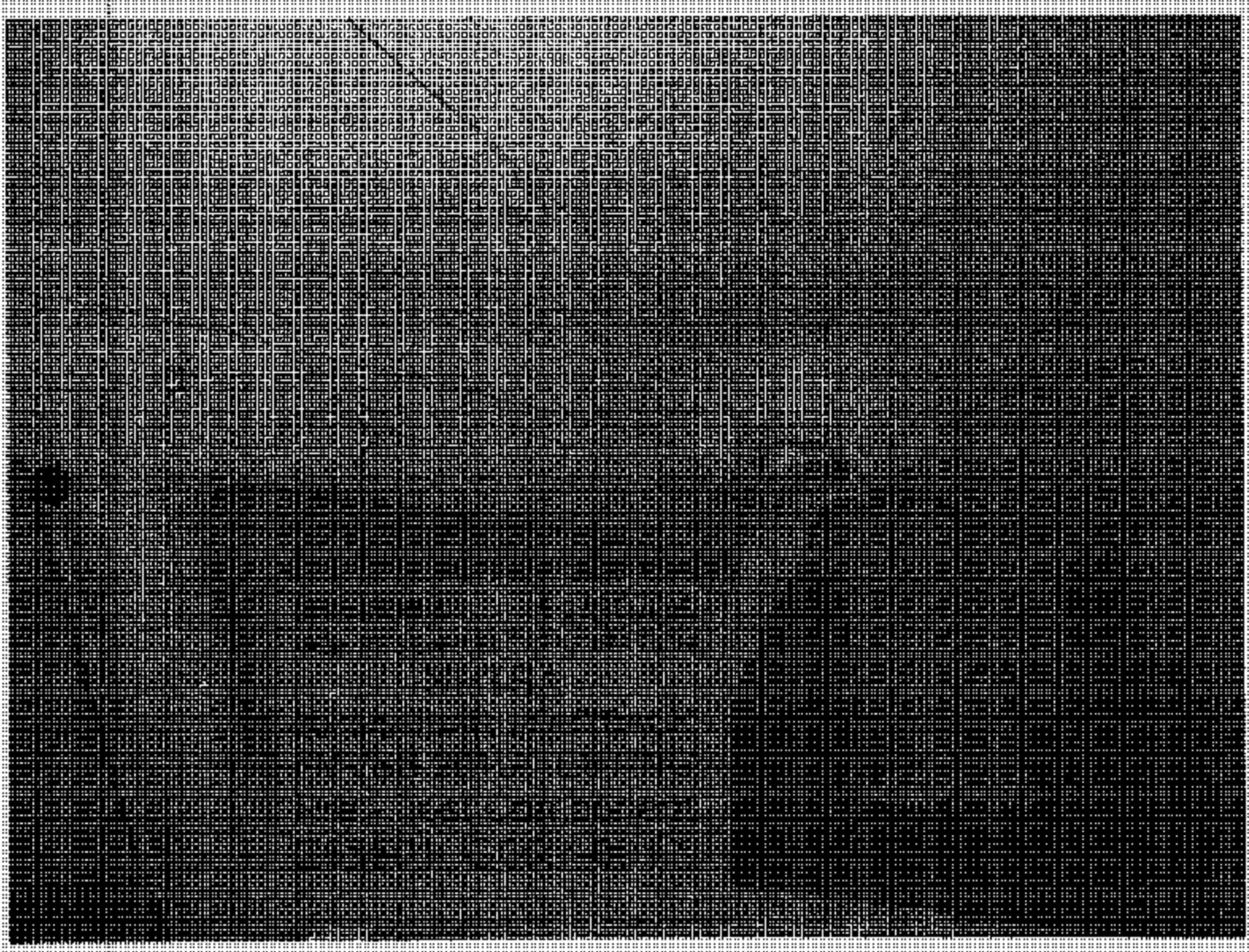






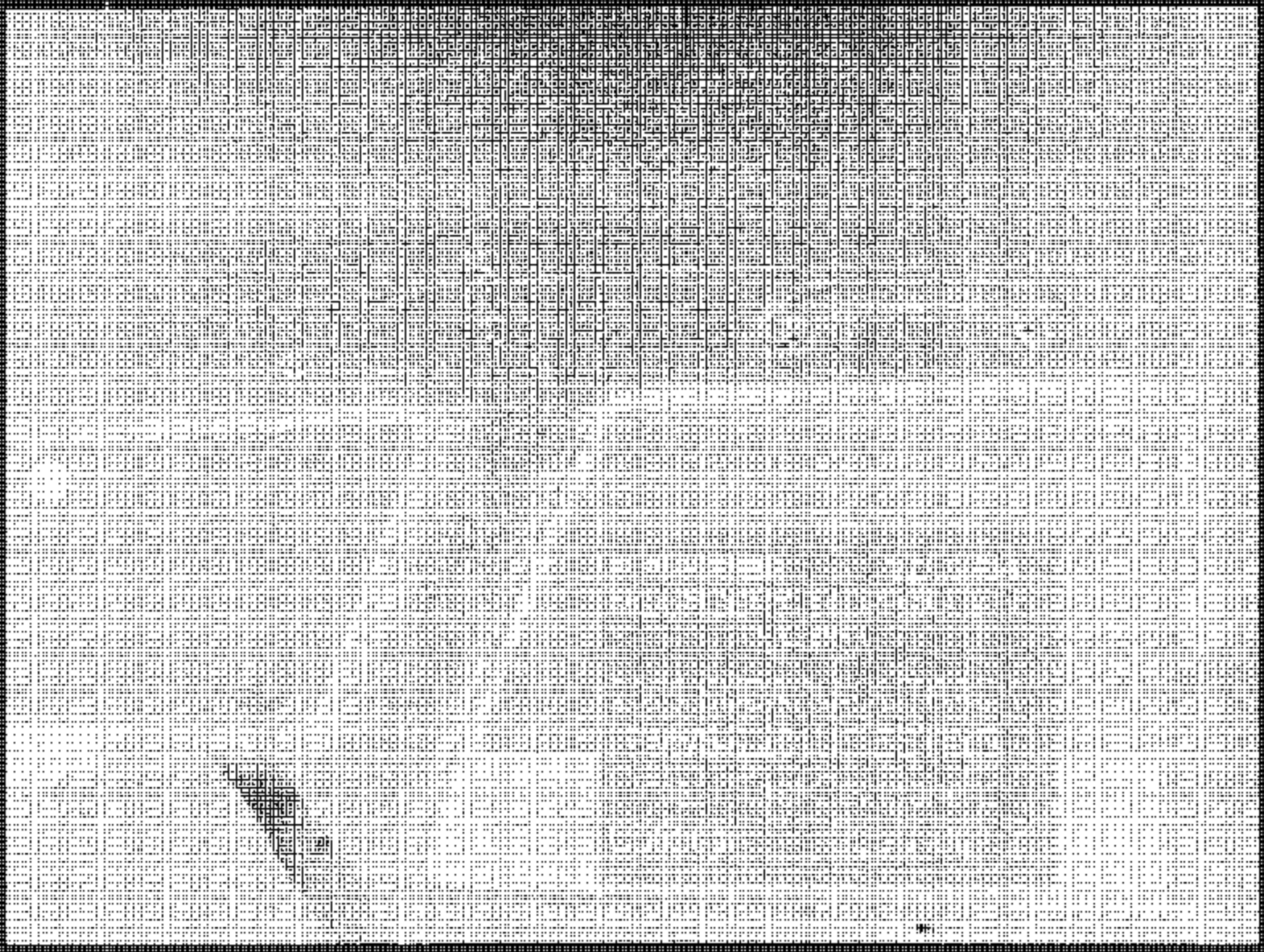


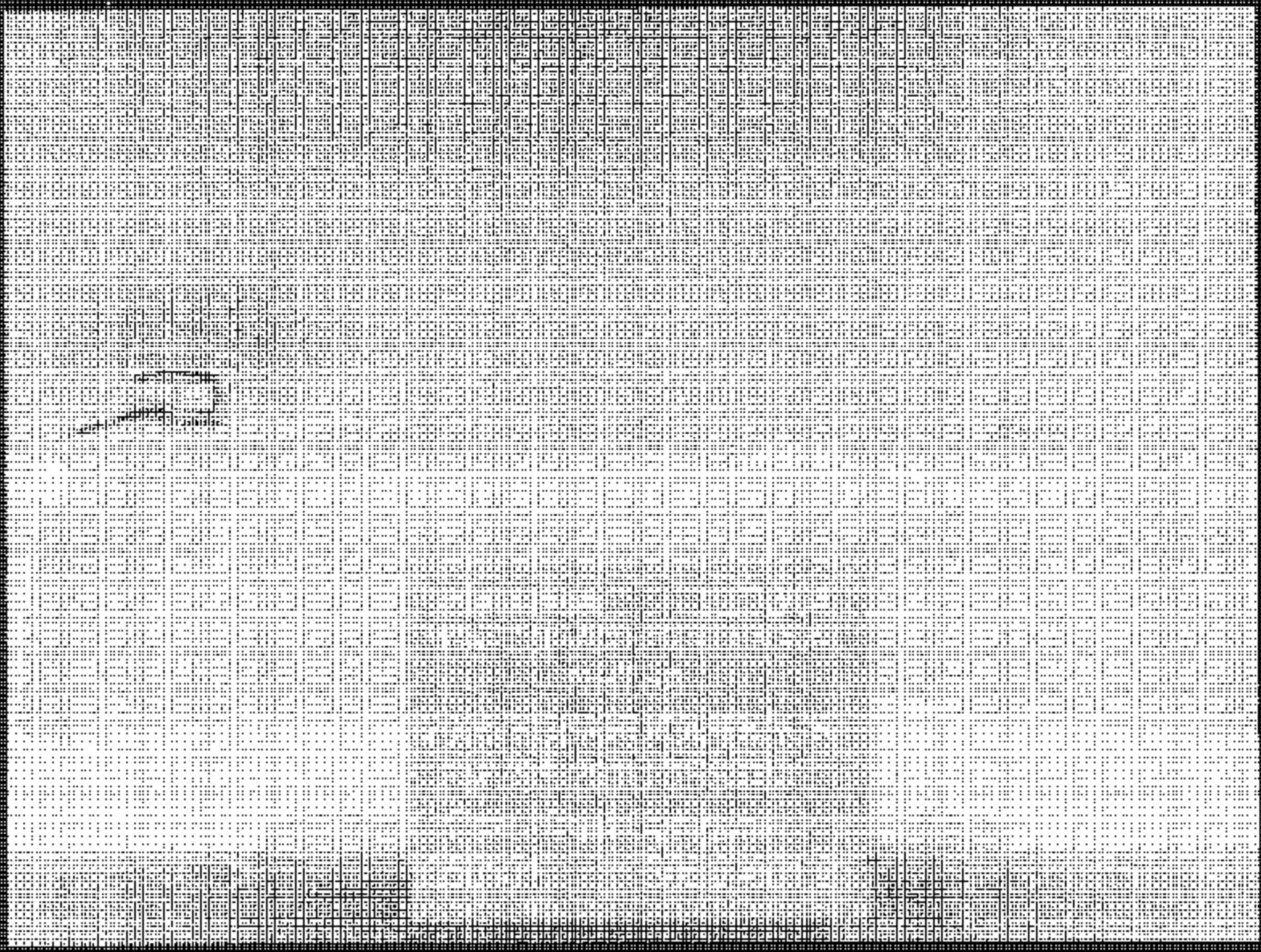


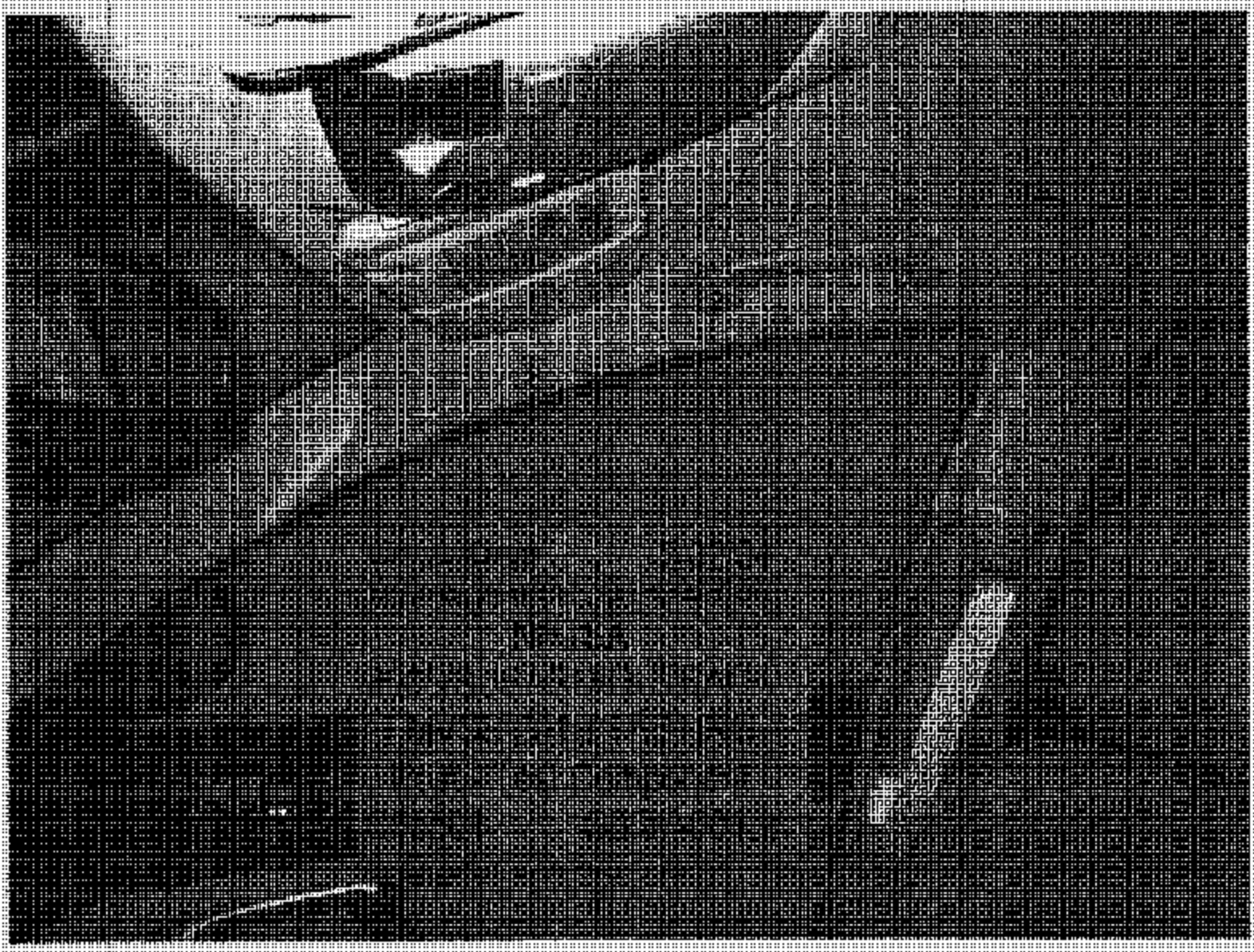


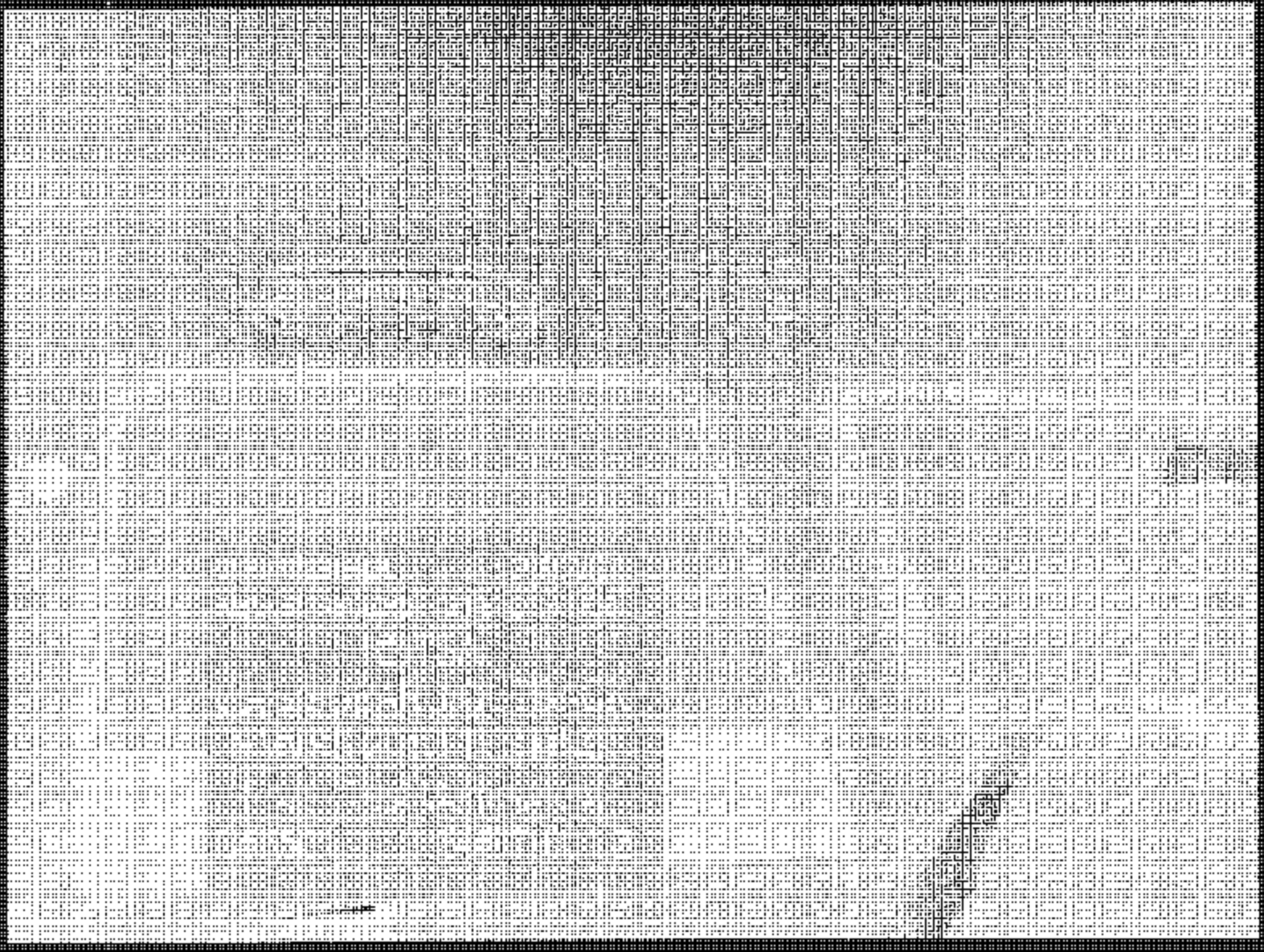




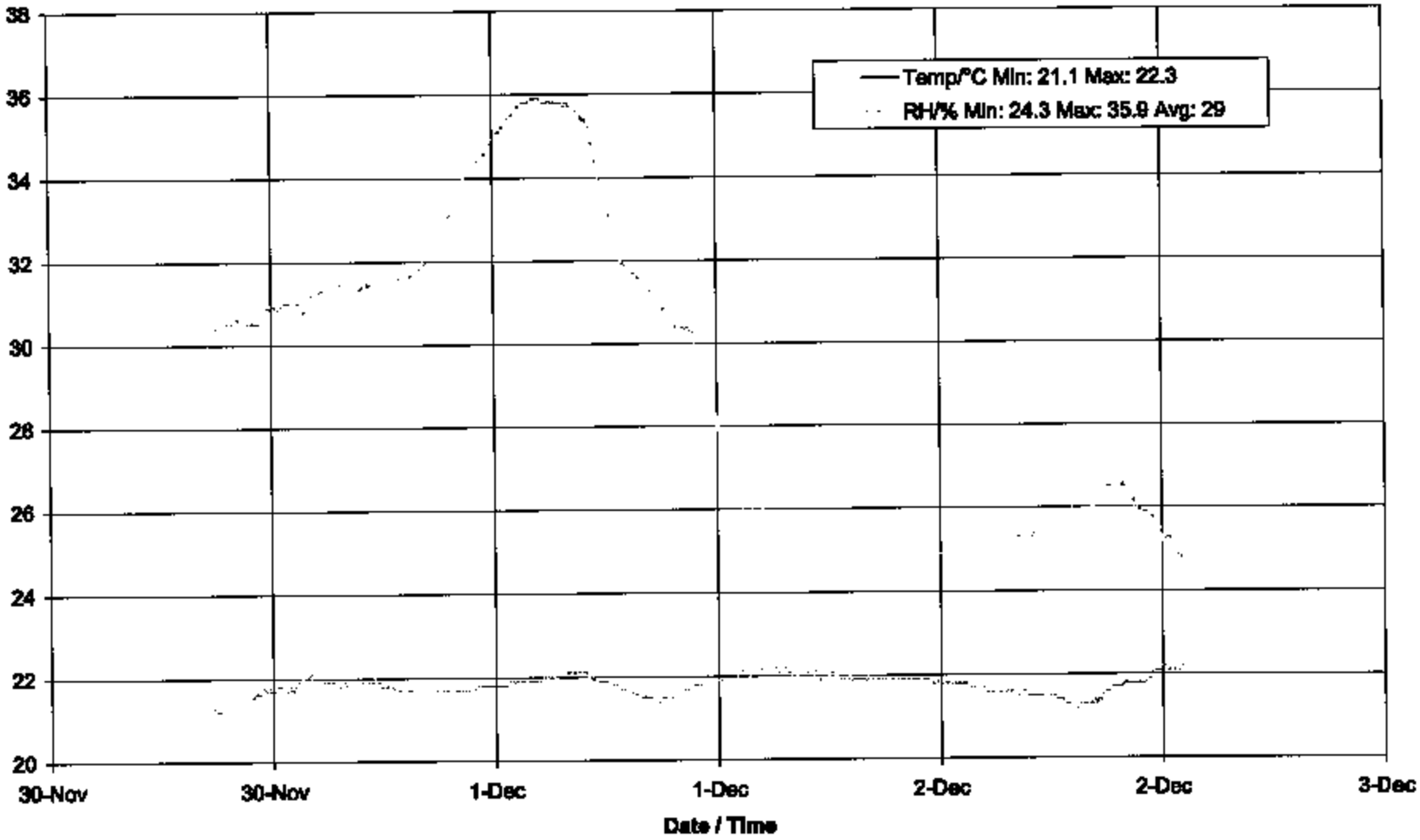








C55501 2005 Subaru Outback FMVSS 201U
Nov. 30 - Dec. 3 2004 Temperature Trace



mga research corporation

CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	**Name:** *Reference Accelerometer*
Model: 7264-2000	**Model:** *301M09/484B*
S/N: J35924	**S/N:** *862/247*
Capacity: 2000 G	**Capacity:** *170 G*
Calibration Date: 11/9/04	**Calibration Date:** *5/11/04*
	Calibrated By: *Chris Vega/PCB Piezotronics, Inc.*

Test Reference Number: A0424

New DLR (100k , Units: G): 94.1

StdDeviation (%) 0.247

% Difference in DLR (New vs. Old): 1.899

Temperature (°F): 72

Humidity (%): 35

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ±3.0%. All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

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248 / 577-5001 • fax 248 / 577-5025
www.mgaresearch.com

mga research corporation

CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	**Name:** *Reference Accelerometer*
Model: 7264-2000	**Model:** *301M09/484B*
S/N: J35919	**S/N:** *862/247*
Capacity: 2000 G	**Capacity:** *170 G*
Calibration Date: 11/9/04	**Calibration Date:** *5/11/04*
	Calibrated By: *Chris Vega/PCB Piezotronics, Inc.*

Test Reference Number: A0424

New DLR (100k , Units: G): 94.3

StdDeviation (%) 0.198

% Difference in DLR (New vs. Old): 0.447

Temperature (°F): 72

Humidity (%): 35

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ±3.8%. All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

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CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	**Name:** *Reference Accelerometer*
Model: 7264-2000	**Model:** *301M09/484B*
S/N: J22664	**S/N:** *862/247*
Capacity: 2000 G	**Capacity:** *170 G*
Calibration Date: 11/9/04	**Calibration Date:** *5/11/04*
	Calibrated By: *Chris Vega/PCB Piezotronics, Inc.*

Test Reference Number: A0424

New DLR (100k , Units: G): 92.7

StdDeviation (%) 0.495

% Difference in DLR (New vs. Old): 0.224

Temperature (°F): 72

Humidity (%): 35

Performed By: David Campbell

Approved By: Helen A. Kalitto

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ±3.8%. All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

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CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	**Name:** *Reference Accelerometer*
Model: 7264-2000	**Model:** *301M09/484B*
S/N: J35916	**S/N:** *862/247*
Capacity: 2000 G	**Capacity:** *170 G*
Calibration Date: 11/9/04	**Calibration Date:** *5/11/04*
	Calibrated By: *Chris Vega/PCB Piezotronics, Inc.*

Test Reference Number: A0424

New DLR (100k, Units: G): 99.6

StdDeviation (%) 0.348

% Difference in DLR (New vs. Old): -0.518

Temperature (°F): 72

Humidity (%): 35

Performed By: James Campbell

Approved By: Helen A. Kaleto

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ±3.8%. All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

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CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	**Name:** *Reference Accelerometer*
Model: 7264-2000	**Model:** *301M09/484B*
S/N: J35918	**S/N:** *862/247*
Capacity: 2000 G	**Capacity:** *170 G*
Calibration Date: 11/9/04	**Calibration Date:** *5/11/04*
	Calibrated By: *Chris Vega/PCB Piezotronics, Inc.*

Test Reference Number: A0424

New DLR (100k , Units: G): 98.1

StdDeviation (%) 0.137

% Difference in DLR (New vs. Old): 0.16

Temperature (°F): 72

Humidity (%): 35

Performed By: Travis Engelbert

Approved By: Helen A. Kaluto

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ±3.8%. All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

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CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	**Name:** *Reference Accelerometer*
Model: 7264-2000	**Model:** *301M09/484B*
S/N: J35923	**S/N:** *862/247*
Capacity: 2000 G	**Capacity:** *170 G*
Calibration Date: 11/9/04	**Calibration Date:** *5/11/04*
	Calibrated By: *Chris Vega/PCB Piezotronics, Inc.*

Test Reference Number: A0424

New DLR (100k, Units: G): 99.8

StdDeviation (%) 0.115

% Difference in DLR (New vs. Old): -1.016

Temperature (°F): 72

Humidity (%): 35

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ±3.8%. All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

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CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: *Reference Accelerometer*
Model: 7264-2000	Model: *301M09/484B*
S/N: I36197	S/N: *862/247*
Capacity: 2000 G	Capacity: *170 G*
Calibration Date: 11/9/04	Calibration Date: *5/11/04*
	Calibrated By: *Chris Vega/PCB Piezotronics, Inc.*

Test Reference Number: A0423

New DLR (100k , Units: G): 110.0

StdDeviation (%) 0.117

% Difference in DLR (New vs. Old): 1.822

Temperature (°F): 72

Humidity (%): 32

Performed By: James Campbell

Approved By: Helen A. Kaleto

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ±5.6%. All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

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CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	**Name:** *Reference Accelerometer*
Model: 7264-2000	**Model:** *301M09/484B*
S/N: J36193	**S/N:** *862/247*
Capacity: 2000 G	**Capacity:** *170 G*
Calibration Date: 11/9/04	**Calibration Date:** *5/11/04*
	Calibrated By: *Chris Vega/PCB Piezotronics, Inc.*

Test Reference Number: A0423

New DLR (100k , Units: G): 101.9

StdDeviation (%) 0.206

% Difference in DLR (New vs. Old): 0.497

Temperature (°F): 72

Humidity (%): 32

Performed By: David Campbell

Approved By: Helen A. Kaleto

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ±3.5%. All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

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CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	**Name:** *Reference Accelerometer*
Model: 7264-2000	**Model:** *301M09/484B*
S/N: J36353	**S/N:** *862/247*
Capacity: 2000 G	**Capacity:** *170 G*
Calibration Date: 11/9/04	**Calibration Date:** *5/11/04*
	Calibrated By: *Chris Vega/PCB Piezotronics, Inc.*

Test Reference Number: A0423

New DLR (100k , Units: G): 96.7

StdDeviation (%) 0.158

% Difference in DLR (New vs. Old): -0.171

Temperature (°F): 72

Humidity (%): 32

Performed By: Jarrett Campbell

Approved By: Helen A. Kaluto

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ±3.8%. All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

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CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	**Name:** *Reference Accelerometer*
Model: 7264-2000	**Model:** *301M09/484B*
S/N: J35800	**S/N:** *862/247*
Capacity: 2000 G	**Capacity:** *170 G*
Calibration Date: 11/9/04	**Calibration Date:** *5/11/04*
	Calibrated By: *Chris Vega/PCB Piezotronics, Inc.*

Test Reference Number: A0422

New DLR (100k , Units: G): 98.4

StdDeviation (%) 0.266

% Difference in DLR (New vs. Old): -0.586

Temperature (°F): 72

Humidity (%): 24

Performed By: Frank Engelbrecht

Approved By: Helen A. Kaleto

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ±3.0%. All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

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CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	**Name:** *Reference Accelerometer*
Model: 7264-2000	**Model:** *301M09/484B*
S/N: J35841	**S/N:** *862/247*
Capacity: 2000 G	**Capacity:** *170 G*
Calibration Date: 11/9/04	**Calibration Date:** *5/11/04*
	Calibrated By: *Chris Vega/PCB Piezotronics, Inc.*

Test Reference Number: A0422

New DLR (100k , Units: G): 92.6

StdDeviation (%) 0.092

% Difference in DLR (New vs. Old): -0.35

Temperature (°F): 72

Humidity (%): 24

Performed By: Jason Engblom

Approved By: Helen A. Kaleto

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ±3.8%. All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

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CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	**Name:** *Reference Accelerometer*
Model: 7264-2000	**Model:** *301M09/484B*
S/N: J35791	**S/N:** *862/247*
Capacity: 2000 G	**Capacity:** *170 G*
Calibration Date: 11/9/04	**Calibration Date:** *5/11/04*
	Calibrated By: *Chris Vega/PCB Piezotronics, Inc.*

Test Reference Number: A0422

New DLR (100k, Units: G): 88.8

StdDeviation (%) 0.323

% Difference in DLR (New vs. Old): -0.776

Temperature (°F): 72

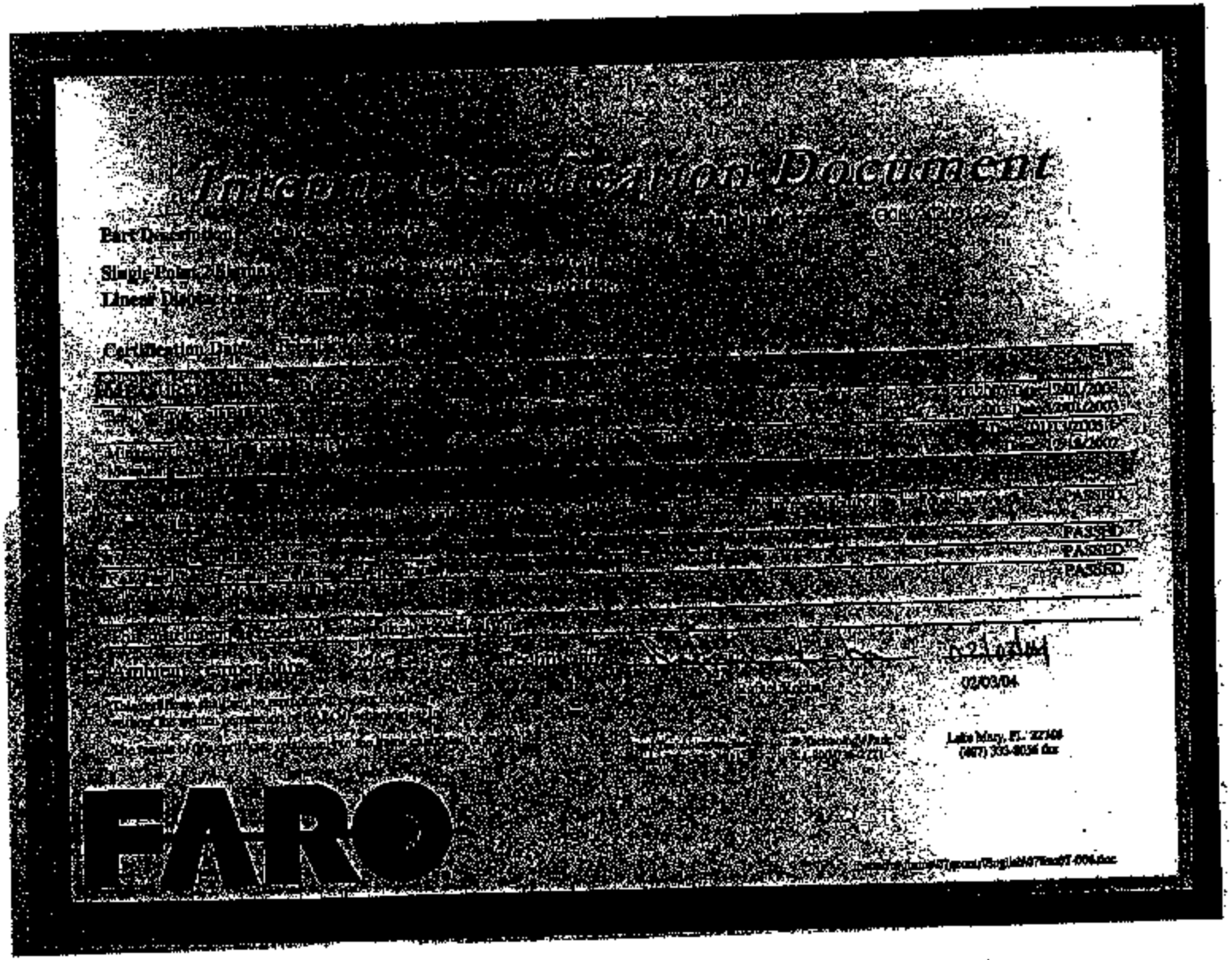
Humidity (%): 24

Performed By: David Engelhardt

Approved By: Helen A. Kaluto

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ±3.8%. All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

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Inspection Document
PASSED
PASSED
PASSED
02/03/04
Lake Mary, FL 32746
FARO

Tape Measure Calibration Certificate

Reference Steel Rule
Brand: GEI
S/N: C/80033
Calibration Date: 11.24.03

Subject Tape Measure
Brand: STANLEY
S/N: 429
Calibration Date: 11.5.04

Reference mm	Subject Tape Measure	Difference	Reference mm	Subject Tape Measure	Difference
0	0	0	450	450	0
25	25	0	475	475	0
50	50	0	500	500	0
75	75	0	525	525	0
100	100	0	550	550	0
125	125	0	575	575	0
150	150	0	600	600	0
175	175	0	625	625	0
200	200	0	650	650	0
225	225	0	675	675	0
250	250	0	700	700	0
275	275	0	725	725	0
300	300	0	750	750	0
325	325	0	775	775	0
350	350	0	800	800	0
375	375	0	825	825	0
400	400	0	850	850	0
425	425	0	875	875	0

If all differences are ± 1 mm, then the tape measure is acceptable.
Pass X Fail ____ Maximum Difference = 0

Date: 11.5.04 Performed By: RJ Smith

Certificate Number: 20040201Cal

Detroit Testing Laboratory, Inc.

7111 E. 11 Mile Road, Warren, MI 48092-4798 • (586) 754-9000 • FAX (586) 754-0049 • www.dtl-inc.com

Certificate of Calibration

Equipment Information

Customer:	MGA Research Corporation 446 Executive Drive Troy, MI 48083	Model:	Pro 360
		Serial Number:	NONE
		Manufacturer:	Mitutoyo
		Description:	Protractor
System ID:	MGA00069		
Customer Asset No.:	MGA00069 (01/29/04)		

Calibration Information

Calibration Date:	1/29/04	Procedure Used:	33K6-4-1597-1/99
Calibration Due:	1/29/05	Calibrated to:	MFR SPEC
Calibration Interval:	12 Month		
Recd In Tol: [1]	No/Fail	Temperature:	20 °C
Returned In Tol: [1]	Yes/Pass	Humidity:	28 %RH
Performed On Site:	No		

Calibration Limitation:

The Uncertainty of the Measurements Pertaining to This Calibration are Estimated to be: Various

[1] Pass/Fail or In/Out of Tolerance statements are opinions only of the person performing the calibration based on data from measurements at the time they were made, procedure utilized, professional experience, and the uncertainty associated with this calibration. It is ultimately up to the user of this equipment to determine if this item meets their specific requirements for accuracy for its intended application.

Calibration Standards Used

System ID:	Model:	Serial:	Manufacturer	Description:	Date Run
00098	CT415H	61201094	Omega	Thermohemidigraph	2/22/04
07745	2 X 2'	13922	TRU-STONE	Granite Surface Plate	2/19/04
18493	SP-66-81	9902	Suburban Tool, Inc.	Sine Plate	2/17/04
09156	CHALLENGER 81 P 09156		AA JANSSON	Gage Blocks	3/5/04

Any calibration issued with this date of this device, if issued, is at the request of the customer. Due to the fact that every variable may affect drift of repeated values over time there is no assurance implied that this item will maintain its present accuracy through the end of this interval.

This Calibration has been performed per requirements of ISO 17025-1999. Reported results are from standards with accuracies that are traceable to the International System of Units (SI), derived from physical constants, ratio measurements, national measurement standards, or compared to consensus standards. Measurement uncertainty is expressed at a confidence level of approximately 95% (coverage factor k=2).

Signature: Paul Wennerfeldt Date: 1-29-04
Paul Wennerfeldt Technician

Approved: Robert Wert Date: 1/30/04

Date Printed: 01/29/04 Printed By: Paul Wennerfeldt Page: 1 of 2 QFC 1048-1 Rev 4/17/03

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Form: F410/12-3 Revision Date 03-11-03
Revision Level: E
STANDARD FORM

20950 Boeing St.
Southfield MI.48075
Phone (248) 358-0590 Fax (248) 355-2529

Sterling Scale Company Inc.
Scale Certificate of Calibration

Customer: MGA Research

Location of Calibration: 446 Executive Dr. Troy MI 48083

Certification Number: 6774

Date of Calibration: 8-11-2004

**Next Calibration Due: 8-2005

Environmental Condition: (Good) Fair Poor

Make:	Model:	Serial/ID#:	Capacity:
S.W. Scales	SW Deluxe	20323.89	8000 x 1#

This certifies that the above scale has been calibrated using the relevant EPO, original equipment manufacturer calibration procedures along with Handbook 44 tolerances using weights traceable to the National Institute of Standards and Technology as well as the International Systems of Units (SI).

Sterling Scale Weight/Weight kit serial #: 1160, 10002, 50967, 20600, 9015, 20150

Calibrated to class: III

Date Weight/Weight kit calibrated: 9/03

Date Weight/Weight kit due: 9/05

Expanded Uncertainty (k=2) confidence level of 95% is reported with the before and after readings on next page.

Temperature 72° Humidity 60%

Pg 1 of 3

These items relate only to these results
Tolerances followed are maintenance/acceptance per HB-44
This report shall not be reproduced, except in full, without written approval of the laboratory.
** Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.
The reported uncertainty is valid only for the environment in which it is determined.

1448.01

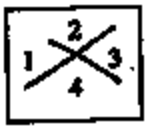
Form: F410/12-3 Revision Date 03-11-03
Revision Level: E
STANDARD FORM

20950 Beaming St.
Southfield MI.48075
Phone (248) 358-0590 Fax (248) 358-0590

Sterling Scale Company Inc.
Scale Certificate of Calibration

Applied Test Weight	Before Adjustment	Tolerance +/-	In tolerance Y / N	After Adjustment	In tolerance Y / N	expanded uncertainty
LF ① 50 lb	50 lb	1lb	Y	50lb	Y	.00346
1000 lb	1000 lb	2lb	Y	1000 lb	Y	.048
2200 lb	2200 lb	2lb	Y	2200 lb	Y	.13
48 ② 50 lb	50 lb	1lb	Y	50 lb	Y	.003
1000 lb	1000 lb	2lb	Y	1000 lb	Y	.06
2200 lb	2200 lb	2lb	Y	2200 lb	Y	.13

Shift test. n/a - Small pad



	1	2	3	4
Before Adj				
After Adj				

Scale condition as found: Clean

Tests performed: ☒ Repeatability ☒ Linearity ☐ Sensitivity ☒ Discrimination

☒ Scale Certified ☐ Scale Rejected

If scale is rejected, why?

Larry Lacey
Sterling Scale Service Rep. Date 8-11-04 w. 24.5

These items relate only to these results.
This report shall not be reproduced, except in full, without written approval of the laboratory.
Tolerances followed are maintenance/acceptance per HB-44
** Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

1448.07

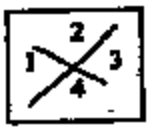
Form: F410/12-3 Revision Date 03-11-03
Revision Level: E
STANDARD FORM

20950 Bonning St.
Southfield MI.48075
Phone (248) 358-0590 Fax (248) 358-0590

Sterling Scale Company Inc.
Scale Certificate of Calibration

Applied Test Weight	Before Adjustment	Tolerance +/-	In tolerance Y / N	After Adjustment	In tolerance Y / N	expanded uncertainty
RE ③ 50 lb	50 lb	1 lb	Y	50 lb	Y	.003
1000 lb	1000 lb	2 lb	Y	1000 lb	Y	.06
2200 lb	2200 lb	2 lb	Y	2200 lb	Y	.13
④ 50 lb	50 lb	1 lb	Y	50 lb	Y	.003
1000 lb	1000 lb	2 lb	Y	1000 lb	Y	.06
2200 lb	2200 lb	2 lb	Y	2200 lb	Y	.13

Shift test. lb - Small pad



	1	2	3	4
Before Adj				
After Adj				

Scale condition as found: New

Tests performed: ☒ Repeatability ☒ Linearity ☐ Sensitivity ☒ Discrimination

☒ Scale Certified ☐ Scale Rejected

If scale is rejected, why?

Larry Lacy
Sterling Scale Service Rep. Date 8-11-04 w.o. 3-3

These items relate only to items tested.
This report shall not be reproduced, except in full, without written approval of the laboratory.
Tolerances followed are maintenance/acceptance per HB-44
** Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

1448.01

Certificate Number: 20040729Cal

Detroit Testing Laboratory, Inc.

ACCREDITED Certificate No. 38.05

7111 E. 11 Mile Road, Warren, MI 48092-2793 • (586) 754-9000 • FAX (586) 754-0040 • www.dtl-inc.com

Certificate of Calibration

Equipment Information

Customer:	MGA Research Corporation 446 Executive Drive Troy, MI 48083	Model:	AI* 20
		Serial Number:	E33603-0213
		Manufacturer:	Detecto
		Description:	Scale
System ID:	MGA00081		
Customer Asset No.:			

Calibration Information

Calibration Date:	3/24/04	Procedure Used:	33KS-4-72-1/98
Calibration Due:	3/24/05	Calibrated to:	MFR SPEC
Calibration Interval:	12 Month		
Rcvd In Tol:[1]	Yes/Pass	Temperature:	24 °C
Returned In Tol:[1]	Yes/Pass	Humidity:	37 %RH
Performed On Site:	No		

Calibration Limitations:

The Uncertainty of the Measurements Pertaining to This Calibration are Estimated to be: (0.006 + 0.01% Ind) lb

[1] Pass/Fail or In/Out of Tolerance statements are opinions only of the person performing the calibration based on data from measurements at the time they were made, procedure utilized, professional experience, and the uncertainty associated with this calibration. It is ultimately up to the user of this equipment to determine if this item meets their specific requirements for accuracy for its intended application.

Calibration Standards Used

System ID:	Model:	Serial:	Manufacturer	Description:	Date Due:
09126	CT485B	612001050	OMEGA	Thermohumidigraph	5/12/04
07580	CLASS C	07580	TROEMNER	WEIGHT SET	9/11/04

Any calibration interval and due date of this device, if stated, is at the request of the customer. Due to the fact that many variables may affect drift of reported values over time there is no warranty implied that this item will maintain its stated accuracy through the end of this interval.

This Calibration has been performed per requirements of ISO 17025-1999. Reported results are from standards with accuracies that are traceable to the International System of Units (SI), derived from physical constants, ratio measurements, national measurement standards, or compared to consensus standards. Measurement uncertainty is expressed at a confidence level of approximately 95% (coverage factor k=2).

Signature: Jerry Wells	Date: 3-24-04 Technician	Approved: Paul Wenzel	Date: 3-24-04

Date Printed: 03/24/04 Printed By: Jerry Wells Page: 1 of 2 QFC 1048-1 Rev 4/17/03

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~Certificate of Calibration~

Model Number: 4843	N.I.S.T. Project #: 8720012
Serial Number: 2470	Calibration Date: 05/11/2004
Description: Signal Conditioner	Recalibration Date:
Test Procedure: AT-108-1	Calibration Technician: Chris Vega cv. #36
Temperature: 74° F	Relative Humidity: 42%

TESTS	BEFORE	AFTER
INPUT VOLTAGE (24 ± 0.1V)	24.02	24.02
ICP CURRENT (4 ± 0.6mA)	3.97	3.97
DC OFFSET A.C. MODE (volts)	-.001	-.001
GAIN (REF 1 VRMS, 1kHz)	1.0000	NOT ADJUSTABLE
DRIFT (DC MODE)	< 2mV/min.	NOT ADJUSTABLE
FREQUENCY RESPONSE 10 Vp-p, 1 kHz REFERENCE	FLAT TO 200kHz	NOT ADJUSTABLE

As Received: In tolerance

As Left: In tolerance

Special Notes: MGA Research

This document certifies that the equipment referenced above meets published specifications. The calibration procedure is in compliance with ISO 10012-1, and former MIL-STD-45662A and is traceable to NIST. *Measurement uncertainty (95% confidence level w/coverage factor of 2) for scale factors is +/- 0.2%.

This certificate may not be reproduced, except in full, without written approval of

~ Calibration Certificate ~

Per ISO 16063-21

Model Number: 393B05/393B (393B17 SYSTEM)

Serial Number: 862/2470

Description: ICP® Accelerometer

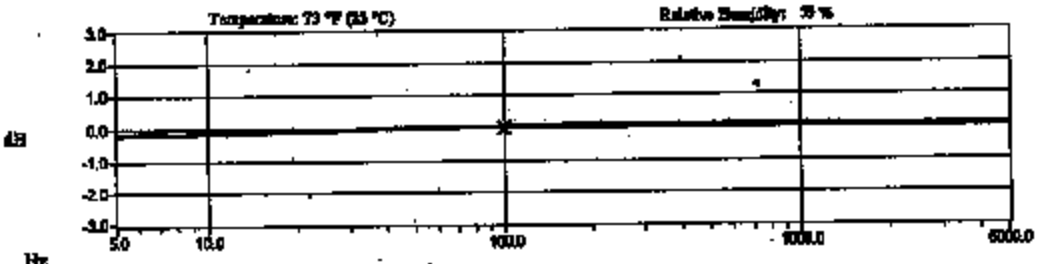
Method: Back-to-Back Comparison Calibration

Manufacturer: PCB

Calibration Data

Sensitivity @ 100.0 Hz	91.17	mV/g	Output Bias	8.6	VDC
	(9.179	mV/m/s²)	Transverse Sensitivity	3.0	%

Sensitivity



Data Points

Frequency (Hz)	Dev. (%)	Frequency (Hz)	Dev. (%)	Frequency (Hz)	Dev. (%)
5.0	-2.5	REF. FREQ.	0.0	5000.0	1.1
10.0	-1.9	300.0	0.7		
15.0	-1.4	500.0	0.8		
30.0	-0.6	1000.0	1.0		
58.0	-0.2	3000.0	1.1		

[illegible] Valid

[illegible]

Condition of Unit

As Found: In Tolerance, No Adjustment Necessary

As Left: In Tolerance

Notes

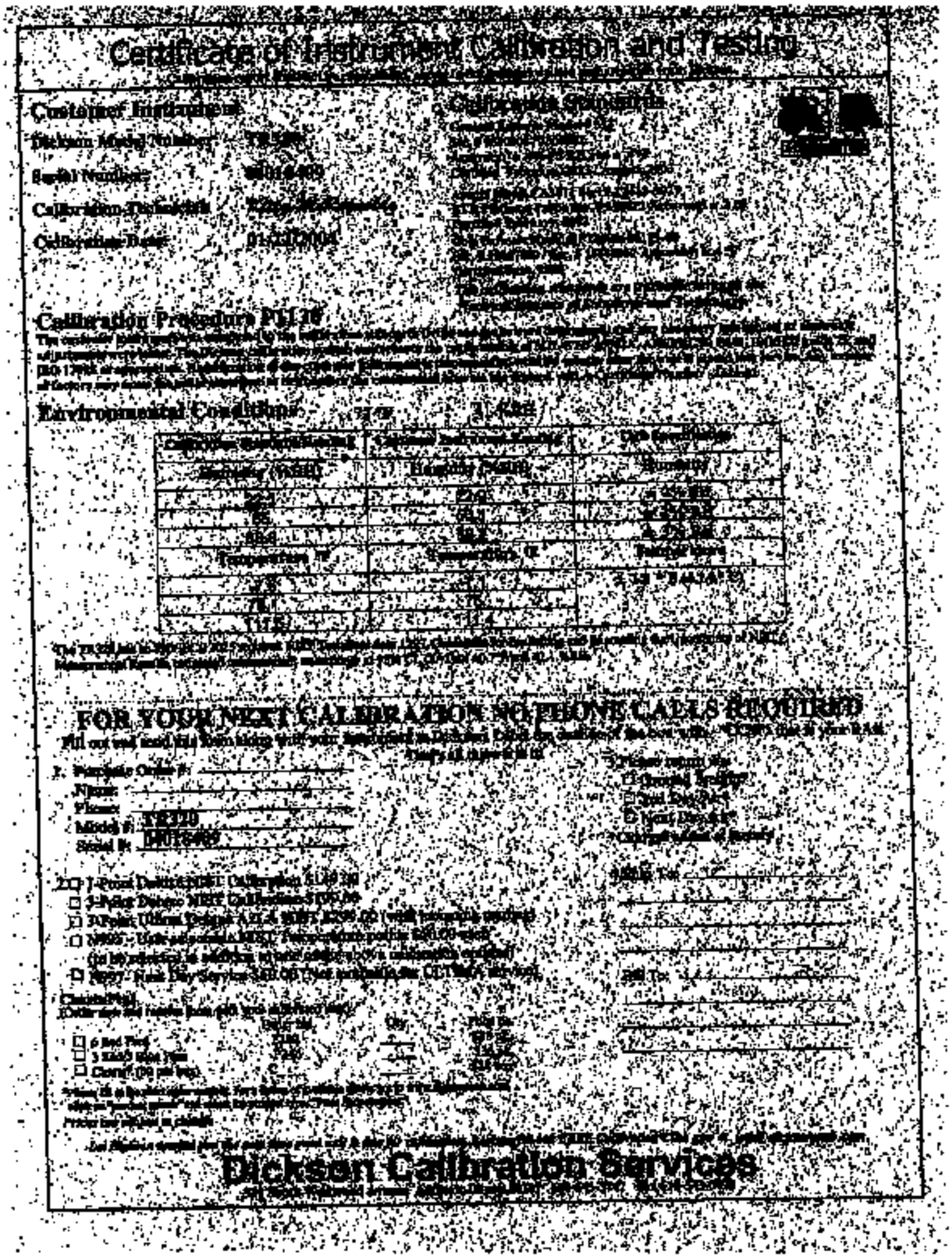
1. Calibration is NIST Traceable thru Project 822/269400 and PTB Traceable thru Project 1055.
2. This certificate shall not be reproduced, except in full, without written approval from PCB Piezotronics, Inc.
3. Calibration is performed in compliance with ISO 9001, ISO 10012-1, ANSI/NCSL Z540-1-1994 and ISO 17025.
4. See Manufacturer's Specification Sheet for a detailed listing of performance specifications.
5. Measurement uncertainty (95% confidence level with coverage factor of 2) for frequency ranges tested during calibration are as follows: 5-9 Hz; +/- 2.0%, 10-99 Hz; +/- 1.5%, 100-1999 Hz; +/- 1.0%, 2-10 kHz; +/- 2.5%.

Technician: Chuck DiMaggio C/D Date: 06/13/04

Cert No: [illegible]

PCB PIEZOTRONICS
VIBRATION DIVISION
3425 Walden Avenue · Depew, NY 14043
TEL: 716-684-0003 · FAX: 716-685-3886 · www.pcb.com

Page 1 of 1



Certificate of Instrument Calibration and Testing

Customer Information

Dickson Model Number: TR320

Serial Number:

Calibration Technician:

Calibration Date: 01/22/2004

Calibration Procedure PT120

Environmental Conditions

Calibration Standard Reading	As Found Instrument Reading	Out Of Tolerance
Humidity (%RH)	Humidity (%RH)	Humidity
Temperature °F	Temperature °F	Temperature

FOR YOUR NEXT CALIBRATION, NO PHONE CALLS REQUIRED

Fill out and mail this form along with your instrument to Dickson. Check the appropriate boxes with "X" and fill in your P.O.

1. Purchase Order #:
Name:
Phone:
Model #: TR320
Serial #:

2. ☐ 1-Point Daily/NIST Calibration $149.00
☐ 3-Point Daily/ NIST Calibration $199.00
☒ 5-Point Ultimate Package A2LA NIST $299.00 (with temperature readings)
☐ NIST - Only available NIST Recertification for $149.00 each
(to be returned in addition to your ordered service calibration)
☐ Rush - Rush Day Service $50.00 (Not available for ULT/A2LA services)

Check One:
(Order this item number from your authorized rep)

	Qty.	Price Ea.
☐ 6 Pad Pack		$0.00
☐ 3 Month Mini Pack		$0.00
☐ Charts (50 per box)		$0.00

Please fill in the information below. Your Name or Company Name must be the Registered Owner of the instrument.
Please list address where you would like the instrument returned.

Bill To:

Ship To:

Please return the:
☐ Original Sensor
☐ Test Sensor #1
☐ Test Sensor #2
Customer Name of Sensor

Dickson Calibration Services